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NGINEERING NEWS.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS has had a most successful meeting this week in New York, as reported elsewhere, extending over four days. The society has been growing rapidly in recent years, and now numbers 1,049 against 1,280 in the Am. Soc. C. E. The library and reading room is to be open nightly hereafter up to 10:30 P. M. The additions last year were 178. The next meeting is to be held at Cincinnati, O., May 20.

BETTER SUPERVISION OF DAMS is called for in Connecticut. The State Association of Civil Engineers and Surveyors has appointed a committee to propose legislation for securing a more thorough inspection of the many dams in the State. The existing law provides for the inspection of new structures, but makes no provision for the inspection of the many dams already built which have been weakened by age and decay.

THE CHICAGO DRAINAGE COMMISSION, to be elected by the people on Dec. 12, will be authorized to expend $60,000,000 in providing the city-water and building the new drainage canal and works. The estimated time for doing all this work is seven years, and it will probably give employment to 10,000 men. As is only too commonly the case in our great cities, the great question in the Chicago mind is, not how or by whom this work can best be done from a professional and structural standpoint, but what political party shall control this immense patronage.

THE FAMOUS OKEFENOKEE SWAMP is to be sold to the highest bidder by public auction on Jan. 7, 1890, according to a bill just passed by the Georgia Legislature. No bid less than 12½ cts. per acre will be considered. An exploring party reports that the greater part of the swamp is rich black mud, from 5 to 20 ft. deep, and only requires draining to make it equal in productiveness to the Mississippi bottom lands. The State has already been offered 12½ cts. per acre by Mr. FRANK HALL, of Dahlonega, and Mr. M. P. PHILLIPS, of Philadelphia. The estimated area for sale is 450,000 acres; and the drainage expense is set down at $400,000 to $500,000.

THE PANAMA CANAL is to be thoroughly examined and "truthfully" reported upon by a commission of five French engineers who sail for Panama on Dec. 10. They are "to conceal nothing and underrate nothing," and if they find the canal impracticable, they are to so report. A little more of this caution and regard for true conditions of work, some years ago, might have saved a loss of about $300,000,000 of French money.

THE BROOKLYN ELEVATED RAILWAYS show an increase in gross earnings over last year of 46.6 per cent. for the quarter ending Sept. 30, or from $223,566 to $325,566. Operating expenses and fixed charges have increased still more rapidly, however, so that the profit and loss account shows a deficit.

THE MOST SERIOUS RAILWAY ACCIDENT of the week occurred on Nov. 14 on the Pennsylvania Railroad, in the Pittsburg yards. The east-bound express, which left Pittsburg at 7.15 P. M., was running at about 8 miles an hour in the yards near Seventeenth St., when the smoking-car left the rails, and after running about 100 ft. turned over on its side. According to the press reports, fire broke out at both ends of the car and in the center almost simultaneously; and while few of the 40 or 50 passengers were seriously injured, they were so imprisoned in the wrecked car that they were in danger of being burned alive. Fortunately help was close at hand, and the flames were extinguished before they could spread far. One man was fatally injured, being caught under the stove when the car turned over. The sudden breaking out of the fire in three different places would seem to indicate that it must have come from the lighting apparatus. Whether the car was lit by oil lamps or by the system of gasoline lighting with which the Pennsylvania is now experimenting, does not appear in the reports; but it is to be hoped that it will soon be made known. Pennsylvania is unfortunate in having no railroad commission to investigate the causes of such accidents, and make them known to the public.

ANOTHER SERIOUS railway accident was a rear collision, Nov. 17, on the Northern Central Railway near Goldsborough, Pa. The engine of the first section of a fast freight train broke down, and the train was stopped; a flagman was sent back, but the second section ran into the standing train; one engine and thirty cars were wrecked, and four cars were burned, being set on fire by the stove in the caboose. One man was killed. The engine driver of the second section claims that the flagman of the first section had not gone far from his train. ——A crossing accident occurred recently at Grand Crossing, Ill., between an Illinois Central suburban train and a Lake Shore & Michigan Southern freight engine, which could not be stopped in time, owing, it is said, to frost on the rails.——A serious accident caused by carelessness occurred on the Fall Brook Railroad near Tioga, Pa., on Nov. 14. A south-bound train received orders to allow two north-bound trains to pass at Tioga. The first train passed all right, and evidently forgetting that another train was to pass soon, the engineer of the south-bound train pulled out just in time to discover the second north-bound train coming and running at full speed. The engineer attempted to back on the switch, but before he reached it the north-bound train crashed into his train, wrecking both engines. Meanwhile the second section of the south-bound train had pulled into the switch, and was met by the first section backing rapidly in, and a second wreck occurred, wrecking the engine of the second section. The wreck caught fire, and the caboose and several cars of the first section were burned. One man was killed.

THE BROOKLYN BRIDGE CABLE RAILWAY was blocked for about an hour on Wednesday morning just in the busy part of the morning. A switch engine, which had just pushed a train out from the Brooklyn station, jumped the track while running back into the station, at the switch near the starter's cabin.——A derailed car also caused a block Monday evening.

BRIDGE ACCIDENTS are reported as follows: The county bridge at 15th St., Centropolis, Mo., gave way under a herd of cattle Nov. 14.——A portion of the false work of the new railway bridge at North Wheeling, W. Va., was carried away by a tug boat Nov. 12.——The Kendall St. bridge at Battle Creek, Mich., gave way Nov. 14, being struck by a house which was being moved; the bridge was in bad condition.——The floods in New York and Pennsylvania have caused much damage to bridges. At Williamsport, Bellefonte, Milton, and Harrisburg, Pa., railway and highway bridges have been wrecked. Several bridges on the Northern Central Railroad, in Pennsylvania, have been washed out. At Milton, Pa., two trestles on the Philadelphia & Reading were washed out.

HEAVY STORMS AND FLOODS have occurred throughout the Atlantic States, and several railways and bridges in New York and Pennsylvania have suffered.——A blizzard caused much interference with railway traffic in Colorado and New Mexico in the early part of the month.——Landslides have occurred on the Pennsylvania Railroad near Bessemer, Pa., on the West Shore road near Utica and Cranston's, N. Y., and on the Philadelphia & Reading at Winfield, Pa.——Washouts have occurred on the New York, Lake Erie & Western near Elmira, N. Y., and on the Peach Bottom Railroad in Pennsylvania.

THE PROVIDENCE, R. I., TERMINAL PLANS, as lately approved by that city, have been accepted by the Old Colony and the New York, Providence & Boston railway companies. But the third road, the New York & New England Railroad Company, replies that it is not now in a position to say that it will join the other roads in carrying out these plans. It may do so after its annual meeting, to be held in December next. The Providence Committee on Terminals recommends that if the New York & New England Company eventually declines to join in the work, such legislative action should be taken as will enable the other roads to go on without it. The committee presented a copy of a proposition tending to hasten the inauguration of the much-needed improvement.

THE CITY ENGINEERING EXPENSES OF PROVIDENCE, R. I., for the year ending Dec. 31, 1888, were $42,583.53, says the Providence *Journal*. When it is considered that the City Engineers Department of Providence performs all the engineering work of that city, this is an exceedingly low expenditure. In nearly every other American city the duties of City Engineer GRAY, of Providence, are divided up among many departments of water, sewers, bridges, parks, surveyor, etc. In Boston, for example, the real total for the engineering services of these several departments was $134,401.41 for the last year, though the "Engineer's Department," so called, is only charged with $33,890.21 in the City Auditor's account.

A JERSEY CITY ELEVATED ROAD is before the Aldermen of that city for permission to build. It would extend from the Jersey City ferry at Communipaw, west to Westside Avenue, on the Bergen Hill side, 2¼ miles. The capital is $1,000,000, and Mr. A. C. CHENEY, President of the Garfield National Bank in New York, is the President of the company. If the franchise is granted, it will take two years to build the road.

KANSAS CITY is to have a new union depot in the north part of the city. The enterprise was incorporated some months ago, and C. RALPH EVANS, one of its promotors, claims to have secured sufficient capital in England to carry the work through.

A BRIDGE OVER WEST STREET, NEW YORK, to obviate the most dangerous part of the disagreeable journey to Broadway from the Jersey City ferries, is proposed by the Pennsylvania Railroad, which is met by the unexpected and absurd claim that it should pay something to the city for thus accommodating the public with most trifling and indirect profit to itself. Instead of making a charge, the city should offer to pay something, and have the overhead footwalk extended, at least, to the elevated railways and if possible clear up to Broadway. It would pay any one of the Jersey City lines, however, to do all this, since, if the improvement were made as thorough and complete as this, there would result a considerable increase of traffic and revenue.

THE CRUISER *Baltimore* has made better speed with more horse power available in her second than in her first trial. The average speed for the four

test hours was 20.2 knots, and she exceeded the contract requirement of 9,000 horse power by about 500 horse power. Mr. WM. CRAMP, of Cramp & Sons, said in an interview that he was satisfied that his firm had built the fastest war ship afloat. The steam pressure at the engines was 125 lbs. as against 115.5 lbs. at the former trial, and the revolutions were 116.8 as against the former 118,due to increased pitch in the screw.

THE JOHNS HOPKINS UNIVERSITY received last week a cash donation of $100,000 from Mrs. CAROLINE DONOVAN, an aged widow lady of Baltimore, Md. In the present straitened financial condition of this famed institution, owing to the failure of Baltimore & Ohio R. R. dividends, this windfall is peculiarly welcome, especially as the disposal of the money is left to the discretion of the Board of Direction.

THE WEST CHICAGO STREET RAILROAD TUNNEL, under the Chicago River, in Chicago, is to be let to contract on Dec. 16, next. The total length will be 1,513 ft. and the tunnel will be 30 ft. wide and 15 ft. 9 in. high above rail level. The Franklin St. approach passes under several 7-story and basement brick buildings. Under the river the lowest point of the track-grade will be 52 ft. below the street grade. The contractor must be responsible for the safety of buildings above the tunnel. Plans and specifications are shown at the office of the company at 444 N. Clark St., Chicago, or at the office of SAMUEL G. ARTINGSTALL, C. E., the engineer, 23 Rialto Building, Chicago.

THE FIRST THROUGH FAST MAIL TRAIN under the new schedule, by which the run from New York to San Francisco is to be made in 4 days, 22 hours and 45 minutes, reached San Francisco at 9.45 A. M., Nov. 19, on time.

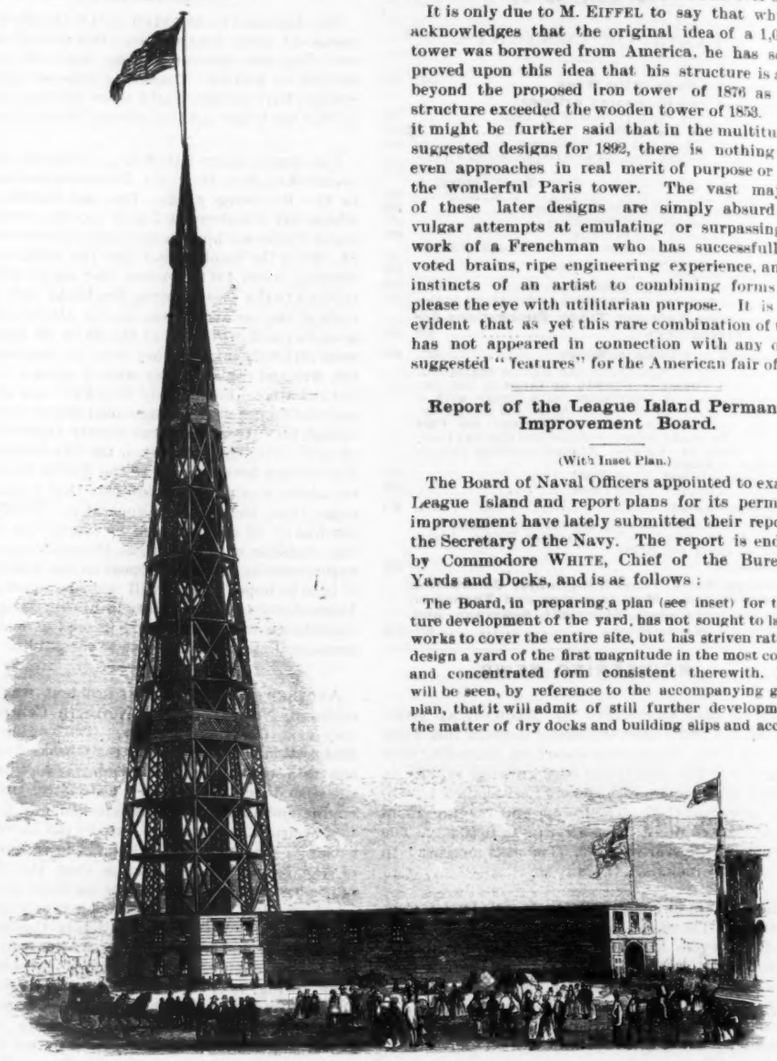
THE TEXAS PANHANDLE route, comprising the railways owned by three different companies, extending from Denver, Col., to Fort Worth, Tex., is likely to become a close ally of the Union Pacific in the near future. How close the consolidation will be, remains to be seen.

THE BROOKLYN U. S. DRY DOCK, now under construction by Messrs. Simpson & Co., will be completed in about two months. This dock will be 500 ft. long, 130 ft. wide at top and 50 ft. wide at the bottom. The material used is yellow-pine with a floor of 14 x 16 in. sticks. It is estimated that nearly 3,500,000 ft. B. M. of timber will be used in it. The foundation was very difficult, the underlying material being mud and quicksand, and the rock lies nearly 80 ft. below the top of the dock. The piles average 45 ft. in length and are driven very closely, capped and floored, and on this floor is a 5½ ft. bed of concrete beneath the dock-floor proper. The caisson for closing the dock is 33 ft. high, 88 ft. long on top and 54 ft. long on the bottom. Three centrifugal pumps, the larger 42 in. and 14 in. diameter, will empty the dock in about two hours. The estimated cost will somewhat exceed $500,000, while a stone dock of these dimensions would cost $5,000,000.

THE STRAITS OF BELLE ISLE DAM is again being discussed, as having an important bearing upon the proposed extension of the Quebec & Montreal Railway to that point. Aside from the convenience of connecting Newfoundland with the mainland across such a dam, and thus securing the shortest possible sea voyage across the Atlantic, there are other important climatic effects expected to result. Gen. Sir SELBY SMYTH, in 1879, proposed to the Dominion Government to divert the Arctic current from the Gulf of St. Lawrence by such a dam; and Lieut. MAURY is said to have suggested the same thing, and to have laid his plan before the British Government over thirty years ago. These straits receive the direct flow of the polar current from Baffin's Bay. If this current could be shunted off into the open ocean, and the branch that now passes through the gulf be prevented from shouldering off the warmer waters of the gulf stream, as is now the case, such a change would very sensibly affect the entire gulf and its adjacent shores.

The New York "Eiffel" Tower of 1853.

At a time when the press of this country is filled with designs for a tower for the World's Fair of 1892, the accompaning view of a tower actually built in this city in 1853 is interesting. The cut is



The Latting Observatory at the Crystal Palace Exhibition of 1853.

reprodued from the New York *Illustrated News*, of May 14, 1853, and many of our older readers will doubtless remember the structure as an adjunct to the Crystal Palace Exhibition buildings of that year.

It was located on Sixth Avenue, between 43d and 44th Streets was projected by Mr. WARING LATTING, and was known as the Latting Observatory The tower was octagonal in plan, with a base 75 ft. in diameter and a height of 350 ft. It was built of wood apparently, and as elevators were then practically unknown, the ascent to top was made by a winding stairway, with several intermediate landings. The brief description accompanying the original cut says that 2,000 people could be accommodated at one time on its various landings, and its safety had been guaranteed by the grand jury of the city.

It is an interesting reminder of the days of wooden construction: and by contrast with the magnificent iron tower of Engineer EIFFEL, in Paris, well serves to point out the advance made in the intervening years in materials for "framed structures," in the means of ascending such structures, and, above all, in the intrinsic beauty which can be given to similar engineering works when the artist and the engineer work together. The Latting Observatory was simply a well-braced "observation mast," rising from an extremely ugly base, built without regard to beauty of form and for a purely commercial purpose. The Eiffel Tower, on the other hand, while also primarily designed for the collection of fees from visitors, was in itself a thing of surpassing grace and the one great decorative feature of the most successful World's Fair ever held.

It is only due to M. EIFFEL to say that while he acknowledges that the original idea of a 1,000-ft. tower was borrowed from America, he has so improved upon this idea that his structure is as far beyond the proposed iron tower of 1876 as that structure exceeded the wooden tower of 1853. And it might be further said that in the multitude of suggested designs for 1892, there is nothing that even approaches in real merit of purpose or form the wonderful Paris tower. The vast majority of these later designs are simply absurd and vulgar attempts at emulating or surpassing the work of a Frenchman who has successfully devoted brains, ripe engineering experience, and the instincts of an artist to combining forms that please the eye with utilitarian purpose. It is very evident that as yet this rare combination of talent has not appeared in connection with any of the suggested "features" for the American fair of 1892.

Report of the League Island Permanent Improvement Board.

(With Inset Plan.)

The Board of Naval Officers appointed to examine League Island and report plans for its permanent improvement have lately submitted their report to the Secretary of the Navy. The report is endorsed by Commodore WHITE, Chief of the Bureau of Yards and Docks, and is as follows:

The Board, in preparing a plan (see inset) for the future development of the yard, has not sought to lay out works to cover the entire site, but has striven rather to design a yard of the first magnitude in the most compact and concentrated form consistent therewith. But it will be seen, by reference to the accompanying general plan, that it will admit of still further development in the matter of dry docks and building slips and accessory structures whenever the military necessities of the country require them at this point.

League Island Station is situated at the junction of the Delaware and Schuylkill rivers; has an area of 923 acres, which is greater than the combined average of the dockyards of Great Britain and any Continental power in Europe. The island is formed of alluvial deposits resting upon a bed of gravel, the soil varying in depth from 16½ ft. to 55 ft. below the plane of mean low water. It is separated from the main land by a sheet of water known as the Back Channel; and connected at the foot of Broad Street by a causeway with a short bridge in the center. It is over 90 miles from the sea and the rise of the tide is usually about 6.2 ft. Salt water never reaches it.

The conflicting assertions appearing in various reports upon League Island in regard to the practicability of obtaining satisfactory foundations for heavy structures have led the Board to make a complete series of borings for itself.

These borings, with the record of others made in former years, show the island to consist of alluvial deposit, composed in places of silt, in others of fine sand, from 12 ft., to 55 ft. thick, resting upon a firm, and in some places almost impenetrable, stratum of compact gravel, round stones, and occasional boulders. This substratum slopes gradually from north to south across the island, as shown on the plan. It is encountered at a depth below the plane of mean low water varying from 16½ ft. to 55 ft. and its thickness is indeterminate.

For the construction of dry docks, basins, and similar works, nothing could be more favorable than this easily

excavated alluvial soil with the solid gravel stratum underlying it at or just below the bottom of the basin or dock. On the other hand, for large structures, sea walls, tool foundations, etc., piles of moderate length easily driven through this light alluvium to a firm bearing in the gravel, form an unyielding, inexpensive, simple, and indestructible foundation.

In projecting the plan of the yard, the Board has utilized the peculiar advantages to the best of its ability. The distinctive characteristics of League Island, viz., an alluvial formation at the confluence of two rivers, with deep water adjacent on two or three sides, a firm underlying stratum, a surface level but little above the river, so that material excavated from basins and docks may be deposited close by without expense to raise the surface to grade, are the very features which experience has taught engineers abroad are to be sought in locating docks and dockyards, as seen in the commercial docks on the Thames, the Wilhelmshafen, and other great foreign dockyards.

The estimates for the complete development of the yard may give the impression of an extremely costly yard when compared with our other yards, but a reference to the plan, with the facilities, etc., shown, when compare with the largest foreign dockyards, as Portsmouth, Wilhelmshafen, Cherbourg, Brest, and Spezzia (which have cost from $10,000,000 to $30,000,000 and are still incomplete), will show that the outlay is a moderate sum in consideration of the facilities provided for construction, repair, and outfit of ships of war and its strategic value. As a strategic naval point it is, unquestionably, the most important on the Atlantic coast. This can readily be seen from the accompanying plans submitted.

In the present condition of the navy, it is believed that in the event of hostilities the ports on the Atlantic coast of the United States could be put under contribution by fleets within a few weeks after the declaration of war, Philadelphia alone is the exception, for its position makes it practically impregnable to naval attack, and in addition, its blockade would be extremely difficult, if not actually impossible.

Now, should League Island be made what the Board proposes it shall be, there will be room in its basins for all the armored vessels we may possess, as well as an indefinite number of cruisers, torpedo, and other vessels of war.

Were these vessels in existence, they could even now fight their way to the assistance of the points attacked, either North or South; but should the canal be enlarged, as a military measure, vessels could pass through on the short lines and arrive in perfect condition ready for battle. At present the canals admit the passage of torpedo boats and small vessels not drawing more than seven feet of water.

It is the opinion of the Board that this navy yard should possess all facilities and appliances for building, equipping and repairing all kinds of naval vessels, including torpedo vessels. It is also the opinion of the Board that this is a proper place to establish a plant for the manufacture of great and small guns. It is proposed that the portion of the back channel east of the causeway shall be filled in and used as a rifle range, and that there shall be in connection therewith grounds for proving great guns, as is now done near Annapolis.

A most important point to be noticed at this station is the fact that all vessels stored here would depart with clean bottoms, as the water is fresh. The fact of this station being in such close proximity to the coal and iron mines and in the neighborhood of so many works of different kinds connected with shipbuilding and supplies, is seen in a much stronger light now than when attention was first called to it.

In this plan it is proposed that ships shall be stored in such a state of readiness that they can be under way within thirty-six hours from the time an order to that effect is received.

It is believed that none of the modern vessels can be placed "in ordinary," as generally understood, but that each ship must have officers and men to take care of it.

The Board especially desires to impress upon the bureau the urgent importance of ample and regular appropriations for the prosecution of this work to its completion. In just the proportion that appropriations are ample and regular will the work be carried on economically, and the yard attain that condition of effectiveness which will make it a powerful factor in the construction and maintenance of the new navy, and in the strategic control of the central Atlantic coast.

The detailed description of the entire work to be done is as follows, and is made in connection with the accompanying plans:

First.—The conversion of that portion of the back channel lying west of Broad St. into a deep and spacious reserve basin.

Second.—The construction of a smaller but still spacious building and repair basin opening into the reserve basin and communicating with the Delaware channel in front of the island by a canal.

Third.—The location of dry docks and building slips on the space lying between the building and repair basin and the Delaware front, the dry docks opening into the basin and the slips fronting the Delaware; the plate and bending shops being between the two.

Fourth.—The concentration of all the other shops and structures pertaining to ship construction, fittings, repair, and armament in the central space enclosed by the building and repair basin, dry docks and building slips on the west, Broad St., the main avenue of the yard on the east, the Delaware on the south, and the reserve basin on the north.

Fifth.—The utilization of the strip of Government property north of the back channel for storehouses for the reserve ships and for coal sheds.

Sixth.—The location of all quarters on the Delaware front of the yard east of Broad St.

Seventh.—The filling of that portion of the back channel lying east of Broad St., and utilizing it for a rifle range and proving ground.

Eighth.—The construction of a permanent retaining wall along the entire Delaware and Schuylkill front of the Government property.

The Board has been a unit in recognizing the fact that ample and convenient basin room is one of the vital requisites of a great naval station, and the exceptionally favorable natural conditions here existing have enabled it to project basins of the capacious dimensions which it considers essential to their highest degree of utility; and the Board believes the arrangement proposed is as convenient and effective as can be devised. The total basin area is 156.4 acres, which is greater than the combined area in either the English or the French dockyards.

To the subject of dry docks and building slips the Board has devoted much study, and has provided a number of building slips for the construction of the smaller classes and lighter types of vessels. It believes, however, that the only proper method of constructing the larger vessels, and especially the armor-clads, both on the score of rapidity, economy, and safety, is in graving docks, and it has estimated for six such docks. The arrangement of the docks and slips in two parallel lines, head to head, with the plate punching, bending and riveting machinery between them, and the location of the large and important shops of the bureaus of steam engineering, ordnance equipment, and recruiting, and navigation, in such a manner as to give them an extensive water front on each basin, will be exceptional in its economy of time and transportation of material, and its facilities for the rapid construction and fitting out of vessels in a sudden emergency.

The rectangular space on which the Board has located the construction, steam engineering, armor and orduance shops, iron storehouse, armor dock and building for heat, light and power plants, is not only central, but presents the most favorable conditions for the construction of the foundations of such structures of any portion of the island, the gravel substratum occurring here at a depth of from 16.5 ft. to 21 ft. below the plane of mean low water. In addition to the general points above noted, the Board, without giving estimates, has indicated where, in its opinion, should be located a hospital, barracks for men, additional docks and building slips, an ordnance foundry, a storage yard for torpedo boats, ropewalk and marine barracks.

It is believed that the accompanying plans and drawings are sufficiently full and clear to render a more minute description unnecessary.

The capacity of the yard completed on the above lines will be equal to that of the largest of foreign dockyards and greater than all our navy yards combined, owing largely to its compactness, economy, and convenience of arrangement and extent of water front and basin area.

Accompanying this report are the following plans:

A—General plan of League Island yard (showing improvements recommended by Board).
B—Chart showing strategic value of League Island.
C—General plan of protection wall.
D—Cross-section of west causeway.
E—General plan of piers.
F—General plan of light retaining wall.
G—General sections and elevations of shops.
H—Plan of the completed yard.
I—Cross-section through the completed yard.

The detailed estimates based upon the above plans for the complete development of the yard are as follows: Building and repair basin excavation, $360,145; building and repair basin quay wall, $376,800; canal excavation, $46,209.50; canal quay wall, $300,000; canal caissons, $80,000; reserve basin excavation, $1,304,829; reserve basin quay wall, $1,260,000; west causeway, $617,500; west causeway caisson, $40,000; repairs to Broad St. pier, $94,000; Delaware piers, $459,415; Delaware quay wall, $115,560; retaining wall, $97,998; widening dykes to 100 ft., $43,245; dredging, $72,243; building and repair docks (four), $2,400,000; armor dock (two), $1,200,000; building slips (eight) $280,000; plate and bending shop, $784,960; steam engineering shop, $661,200; ordnance shop, $436,600; equipment and recruiting and navigation shop, $325,200; armor shops, $600,000; construction shops, $582,000; torpedo-boat shops and basin, $130,000; ships' storehouses, $90,000; iron storehouses, $261,000; coal sheds and tips, $40,000; gateway and guardhouse, $12,000; building for steam heating, electric lighting and hydraulic power plants, $60,000; commandant's office, $53,000; paymaster's office, $19,000; surgeon's office, $19,000; commandant's quarters, $30,000; officers' quarters (twenty), and filling and grading about the same, $233,200; warrant officers' quarters, $20,000; railroad tracks, $79,000; widening Broad St. causeway, and closing sluiceway, $12,000; brick wall along north side of yard, $156,000; roads, pavements and sidewalks, $437,776; sewers and drains, $50,000; water supply system, $100,000; electric light plant, $80,000. Total $14,565,480.50.

No estimate is made for filling the eastern portion of the back channel nor for grading the remainder of the yard. The closing of the Broad St. causeway will result in the rapid silting up of the back channel, and the remainder of the filling can be done with the material excavated from the reserve basin. The material from the building, and the repair basin, and the docks will be sufficient to bring the working portion of the yard to grade.

The proposed permanent improvements recommended to be first undertaken are as follows: Building and repair basin, excavation, $360,145; building and repair basin quay wall, $376,800; canal excavation, $46,209.50; canal quay wall, $300,000; canal caissons, $80,000; west causeway, $617,500; west causeway caisson, $40,000; Delaware quay wall, $115,560; Delaware piers (five), $459,415; repairs to Broad St. piers, $94,400; retaining wall, $97,998; widening dykes to 100 ft. $43,245; dredging, $72,243; armor dock, $600,000; building slips (three) $105,000; plate and bending shop (400 ft.), $285,440; steam engineering shop (north half), $393,000; equipment and recruiting and navigation shop (north half), $193,000; ordnance shop (north half), 257,800; building for steam heating, electric lighting and hydraulic power plant, $60,000; commandant's office, $53,000; commandant's quarters, $30,000; officers' quarters (six) and filling and grading about the same, $73,000; warrant officers' quarters, $20,000; widening Broad St. causeway and closing sluiceway, $12,000; railroad tracks, $65,200; swing bridge over canal, $75,000; roads, pavements, and sidewalks, $50,000; sewers and drains, $20,000; water supply system, $40,000; electric light plant, $50,000; coal shed, $20,000; brick wall along north side of yard, $156,000; gateway and guardhouse, $12,800. Total, $5,374,155.50.

The above improvements, with those now existing at the yard, will give the yard a capacity for effective work equal to that of the best of our other navy yards to-day. And we estimate the amount of money necessary to properly commence operations at $1,506,000, to be applied to the following objects: closing and widening Broad St. crossing, and laying railroad tracks from Government Ave. to end of Broad St. Pier, $30,000; East Dry Dock Pier, $57,000; West Dry Dock Pier, $80,500; quay wall on Delaware front, $75,000; dredging and filling in, $75,000; light retaining wall, $25,000; officers' quarters (six) and furniture, $70,000; pavement, Broad St., $21,000; one building slip, $35,000; plate and bending shop (100 ft.), $75,000; canal walls, $900,000; west causeway, $617,500; caisson, $40,000; Broad St. pier, $95,000; total, $1,506,000.

ENDORSEMENT.

BUREAU YARDS AND DOCKS,
NAVY DEPARTMENT, Oct. 22, 1889.

The Bureau fully endorses the favorable description given by the Board of the manifest advantages of League Island for the location of a first-class steel ship-building navy yard. The cogent reasons advanced are unanswerable. League Island is near the centre of the coal and iron regions and the steel ship-building industry of the country. It is the only navy yard surrounded by fresh water, so necessary for the preservation of steel vessels and of timber structures from the ravages of the teredo. The formation of the island, a low-lying level of alluvial deposit upon a hard bed of gravel, is just what is needed for the easy and successful construction of dry docks, fitting basins, wharves, machine shops, and all kinds of permanent structures. Add to these reasons the fact of its large area, accessibility from a great city, and its perfect defensibility against a foreign enemy, and it can be readily appreciated that its position is unexcelled for the purpose desired.

The large amount of money necessary for the completion of this yard upon the admirable plan recommended, should not be an objection to entering upon the work. A regular annual appropriation, devoted to developing the capabilities of this site, would gradually expand its facilities, in unison with the steady growth of the nation's necessities, until we should possess the finest dockyard and steel ship-building establishment in the world. While this desirable result contemplates the lapse of years, the Bureau believes that the League Island Navy Yard should be at once prepared for building steel ships. I have already estimated for $330,000 for buildings for this purpose. I urgently recommend that Congress appropriate this amount at its next session, as the League Island Navy Yard will then be prepared to build a steel vessel, as far as this Bureau is concerned.

(Signed) GEO. B. WHITE, *Captain U. S. N.*,
Chief of Bureau of Yards and Docks.

OLD COAL CARS of the four-wheel type are being burned by the Philadelphia & Reading Company. The trucks are removed and the car bodies are massed in a pile and burned. All new coal cars will be of the eight-wheel type.

The New Bear Valley Dam.

In our issues of April 7 and June 23, 1888, we gave full details of the remarkable arched dam the boldest in the world by far, by which an artificial lake 57 ft. in depth is created in the Bear Valley, above Redlands, Cal., and 1,482 million cubic feet of water stored. It was from the first foreseen that it would be desirable to increase the height to 80 ft. in order to store about three times as much water, and it was from the first intended, as is obviously proper in such a case, and as was explained in our earlier description, to make the new dam amply strong to stand merely as a gravity dam, even if its integrity as an arch was destroyed, leaving its arch strength as an additional factor of safety.

Even this, however, is now deemed an inadequate height, and it is proposed to make the new dam 40 ft. higher yet, or 120 ft. in all, increasing its capacity 5-fold over the 80 ft. dam, and nearly 14-fold over the present dam, the capacities in billions of cubic feet standing as 1.48, 4.16, and 20.11. The basin will then be completely occupied, so that no spillway will be needed at the dam, but the spillway will be at the upper end of the lake over the divide, into another watershed, the surplus flowing out onto the desert on the other side of the San Bernardino mountains, where it will doubtless be utilized to some extent when the time comes.

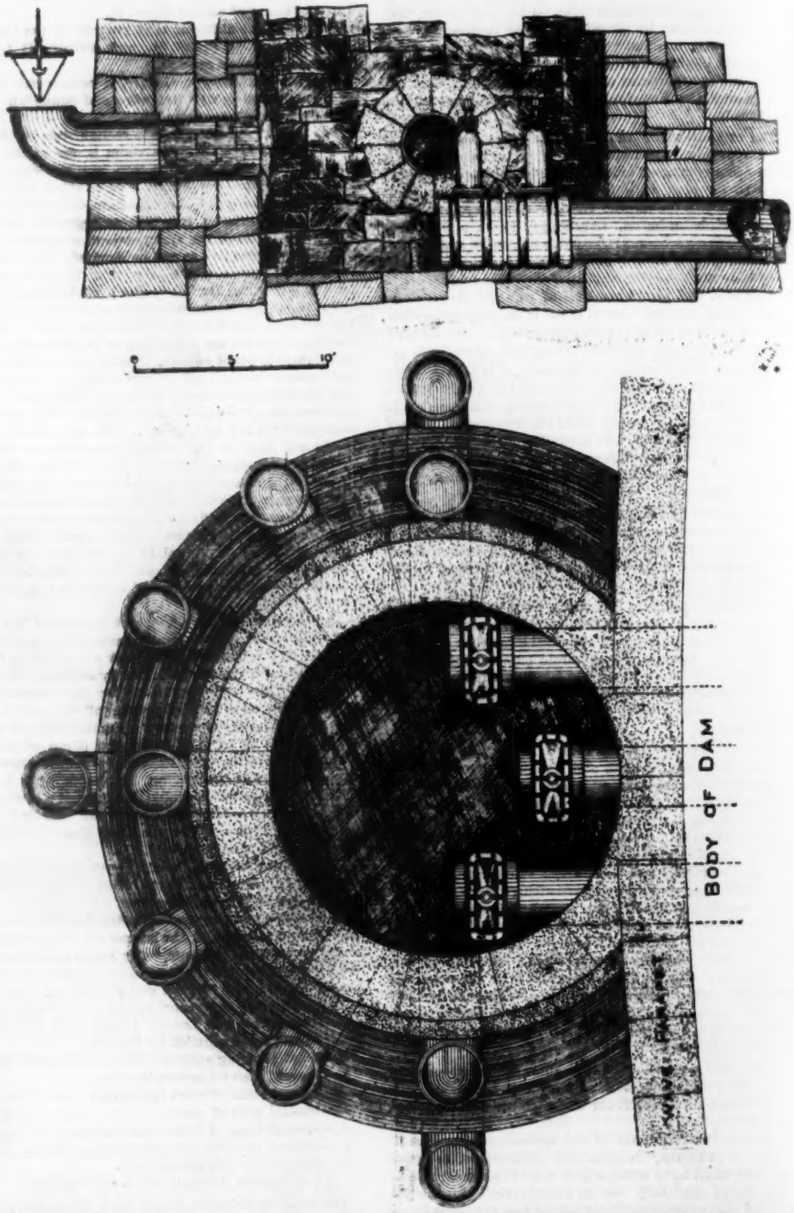
The able engineer of the first dam, Mr. F. E. BROWN, is no longer acting as engineer to the company, which owes a great debt to him for his courage and skill in making small means go a long way, and so enriching engineering with one of its most instructive examples of the possibilities of dam construction. He has been worthily succeeded, however, by Mr. JAS. S. BLACK, of the firm of Black & Chamblin, Civil Engineers, of Redlands, Cal., who has prepared designs for the new structure, and to whose courtesy we are indebted for the details which we present herewith. Mr. BLACK says in an accompanying note:

> For a long time I have intended to send you a condensed description of the proposed new dam at Bear Valley in this county, and I take this opportunity to send you copies of my reports on the subject: a copy of the strain sheet, a plan and cross section of the new dam, and details of the gate-well, and outlet and inlet pipes.
>
> It has been suggested that in building a batter of one inch per foot be given to the back instead of making it vertical, as shown on the drawing.
>
> This batter would take over 7,000 cu. yds. extra of masonry, and, of course, would add some strength. But while I approve of making the dam as much heavier than the theoretical section as the finances will admit of, I cannot think that the proposed batter is the wisest possible distribution of the material added, for the following reasons:
>
> The normal condition of this reservoir will be full or nearly so. Only in extremely dry seasons will it probably be drawn down below the 100 ft. level. If the dam were built as shown on the strain sheet, and the reservoir were full of water, and a given amount of masonry were to be added to the structure, it could not be put at any point where it would do so little good as at the bottom of the back, where the batter will be the thickest, for there will be no compression, and the added mass could only help by pulling down with the cohesive power of its mortar.
>
> If this mass were added at the top of the dam next the back, it would move the center of gravity of each successive block nearer to the back, inducing a compressive strain throughout the back, which would be a good thing.
>
> If the reservoir were empty, the case would, of course, be different; but even then the pressure of the foot of the vertical back would be less than at the outer toe when full, and as there are many higher vertical walls than this in existence, and as probably no dam has ever failed from a like cause, I would not think it wise to expend very much material in guarding against the structure being destroyed by its own weight when empty.

From the documents thus transmitted to us by Mr. BLACK we abstract the following further details, one fact being especially significant, that this sharply curved dam actually contains *less* material than if it were built straight, thus more than corroborating what we said on this subject in several articles in the early part of 1888.

The present dam is 57 ft. high. Though the actual demand for water for irrigation on the land covered by the Bear Valley plant, and the demand of the immediate future, can easily be met when the water is raised to the 80 ft. level, yet it appears certain that as the country develops, the time will come when the ultimate extension to the 120 ft. level will be called for. In view of this fact, it has been deemed of vital importance that the new dam be so designed as to be readily capable of extension to the 120 ft. level. Consequently the plans are for a dam of this height, and such a portion of the structure as the exigencies of the case demand may be built at present, and the work completed as fast as the demand for water arises.

In considering the question of location for the new dam, two sites seemed available: 1. Immediately below and adjoining the old dam, and retaining it as a part and parcel of the new structure. 2. A new site about 150 ft. down stream from the old one and entirely separate and independent of it.

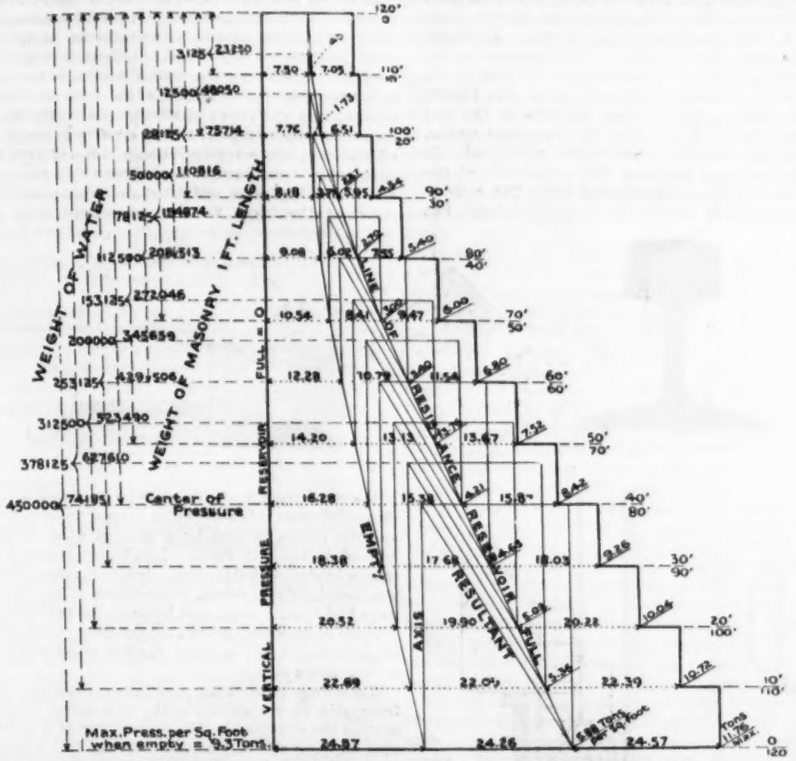


The New Bear Valley Dam. Plan of Gate Well, and Vertical Section through Lower Inlet.

In examining these two sites it was found that, while the present structure is located on the best possible site for a dam of that height, the topography of the cañon above that level is such that when the dam is finally carried to a height of 120 ft. it can be built on the lower site with a saving of over 5,000 cu. yds. of masonry, and with very much less excavation. That hard and seamless rock will be much sooner reached on the lower site than the upper is evident from a mere casual inspection of the country.

Concerning the question of building onto the old work, it was decided that no bond could be formed between the long vertical face of the old dam and the new work, and that the resultant seam, which would be widened somewhat by the slight projections of the rocks in contact slipping past each other as the new work settled, would become filled with water under hydrostatic pressure, thus practically throwing away the old work and becoming an element of danger to the new. It was also thought that in the consideration of the heavy strains to which the abutments of the present dam are subjected, it would be unwise to tamper with them to the extent necessary to secure suitable foundations for the new work. The present dam has no inside gate-well, and such a contrivance being absolutely necessary to render repairs on gates and pipes possible without first drawing off all the water in the reservoir, and as the new site admits of the construction of such a well without submarine work, this consideration alone was deemed of sufficient importance to determine the question in favor of the new location even if the cost of the latter were much greater. The present dam is leaking through seams in the bed rock and about the outlet to the amount of about 54 miner's inches. As this leakage takes place the year round, and as the reservoir is only likely to be drawn on during the

four irrigating months, it follows that if the leakage could be stopped for the other eight months the capacity of the reservoir would be increased by 100 miner's inches during the irrigating seasons. Contending with this leakage would be one of the most serious problems involved in the construction of the new work on the old site, and quite likely it could not be successfully coped with without drawing off the water now in the reservoir.



Section of New Bear Valley Dam, showing Strains and Dimensions.

It is expected that by building on the new site all leakage can be stopped; and this can be the more readily accomplished from the fact that when the new dam has reached the height of the present one, water can be admitted between them, and if any leaks are found, the water can be drawn off again and the defects remedied. In consideration of the foregoing facts, the new site, as shown on the contour map and plan, was adopted.

In designing a theoretical profile for the new dam, the object was to have it distinctly a gravity structure; that is, one which resists the pressure of the water under all normal conditions simply by its own weight, and not by transmitting the pressure to the hill sides by arch action.

In order to correctly analyze the forces involved and to compute the resultant strains, it has been considered as if straight in plan, though, when built, the inner vertical back will conform to the arc of a circle whose radius is 450 ft., as shown on the plan herewith.

The following limiting conditions were assumed as satisfactory and the profile designed in accordance therewith:

Height 120 ft.; top width 15 ft.; limit of pressure 12 tons per sq. ft.; average weight of a cubic foot of masonry 155 lbs.; no tensile strains nor danger of sliding. In determining the general form of the profile, all the leading types were carefully compared and the somewhat unusual one shown, a stepped outer face and vertical back, adopted as best adapted to the case in hand, for a number of reasons which we need hardly review at length.

Having thus determined on the general form, 15 ft. was assumed as a desirable width for the top because this would leave room for a good wave parapet on the upper edge, a wall or iron railing on the lower edge, and a driveway between, at the same time offering a suitable thickness to resist wave action in heavy storm and the pressure of ice in winter. Starting to figure from the top downwards and keeping all the limiting conditions in view, it was determined to make the steps uniformly 10 ft. high. No offset was found necessary at the first 10 ft., but an offset of one-fifth was given for the sake of symmetry of appearance. Carrying the calculations on down, it was found that at the next step an offset of 1.85 ft. was necessary to keep the resultant of the water pressure and the weight of masonry back to the outer edge of the middle third of the base, in which condition there will be neither tension nor compression at the back of the dam, and the mass will have a safety of two against overturning by rotating about the toe.

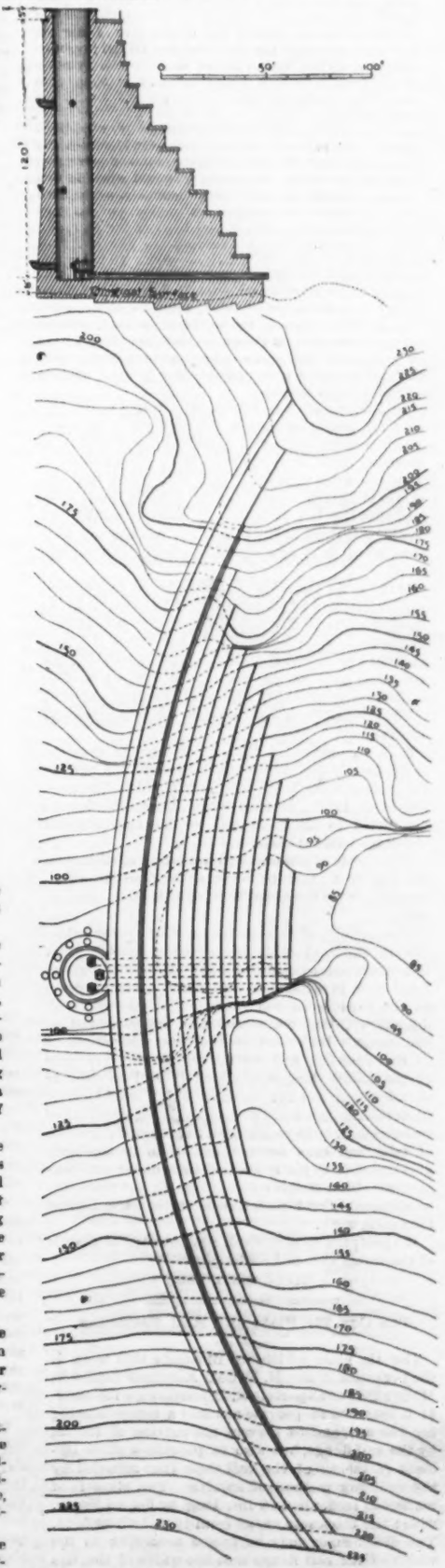
This condition has been maintained clear to the bottom on the structure, at which point the maximum pressure on the outer toe and in the direction parallel to the final resultant is 11¾ tons per sq. ft., when the reservoir is full to the top. When the reservoir is empty, the maximum pressure upon a square foot of the base due to the superincumbent mass will be 9.3 tons next to the back. The accompanying strain sheet (to be published next week) shows a complete analysis of the forces and proportions of the dam.

The final resultant very nearly approaches the angle of repose for dry rock upon dry rock; but as this angle is not quite reached, and as there would still be the bonding power of the cement to prevent slipping even if it were reached, and as the stepping of the bed rock and the inclining of the beds of the outer courses of masonry, to be mentioned farther on, will greatly reduce this angle, the dam is regarded as entirely safe against sliding on its base or at any point further up.

Although this dam is designed to be entirely safe under all normal conditions, even if constructed on a straight plan, it is built in the form of a curve or horizontal arch for reasons which are thus summarized:

1st. Additional security against an earthquake or cataclysm which, of however remote probability, is possible in any locality and should be guarded against. This additional factor of safety, although perhaps indeterminate, must nevertheless be a large one, and, I believe, should never on any account be disregarded where available.

The question of arch action in curved dams has of late been the subject of considerable discussion in engineering circles, but seems to me to be authoritatively and forever set at rest by the fact that the present Bear Valley dam stands apparently as good as ever, and has for five years held water up to 44 ft. above the offset at the foundation, when it could not by any possibility have stood with the water at 23½ ft. above this point if the dam had been straight.



Plan and Section of New Bear Valley Dam.
JAMES S. BLACK, *Engineer.*

2d. The topography of the cañon at this point is such that the dam can be built on a curve whose radius is

450 ft., measured to the vertical water-face, with less material than it could be if built straight or with any other radius. As a means of forming an approximate idea of the strengthening effect of this curved form, I offer the following figures: If the water weighed 125 lbs. per cu.ft. instead of 62½ lbs., the weight of masonry and pressure of water would be then in equilibrium, that is, the dam would then be just on the point of tipping forward, this tendency to tip forward would be met and resisted by each stone in the dam crowding against its neighbors, which would induce pressure in the vertical joints of the masonry in a direction normal to the radius of curvature. How much pressure the masonry would stand in this direction cannot be determined definitely, as no such mass has ever been tested to destruction; but we have an example before us of the dam built of the same materials in the same place and subjected to like conditions from which a comparison may be made. To bring this average horizontal pressure per square foot in the cross section of the 120 ft. dam up to that now existing in the cross section of the present dam, would require an addition of 88 lbs. per cu. ft. to the 125 lbs. assumed, making 213 lbs. per cu. ft. that the water would have to weigh to produce in the new dam strains equal to those to which the present dam is now subjected and which it appears to bear without fatigue.

In this connection attention is called to the fact that in this cross-section the safety will be somewhat greater than the figures on the strain sheet indicate, while in a curved or plain cross-section it would be somewhat less. It is also noted that the strain is figured at the lowest point of each step, and that the line of resistance passes rapidly into the middle third of the base till it reaches the next step, when it is again at the edge of the middle third.

If the same material were distributed in a curved profile, the line of pressure would keep about as far from the edge of the middle third, as it is half way up on each step; but the thin toe, where the base met the curve, would not be capable of resisting the strain as well as the toe of the stepped profile, backed up as it is by the mass of masonry above it.

The stepped form was therefore recommended and adopted.

It is recommended that if possible the dam be started at the full width at the bottom, and carried up to the 80-ft. level of the full width due to a height of 120 ft., so that when finally the dam is completed to 120 ft. it will be one homogeneous structure without seam.

If the state of finances will not admit of this, then the first 80 ft. may be built with a profile corresponding with the upper 80 ft. of the 120-ft. dam, as before.

The capacity of this reservoir when extended to the 120-ft. level will be probably greater than the combined capacity of any ten artificial reservoirs now in existence, and sixty times as great as the capacity of the Conemaugh reservoir near Johnstown, Pa., whose collapse lately proved so disastrous. Its effects on the future development of the country, and on the value of every acre of the many thousands which it will be capable of watering, and the damage which would result from these many acres of orchard being deprived of water even for one year after a twenty years' growth of trees had been secured, are all so incalculably great that it is justly deemed best, under any conceivable circumstances, to use nothing but first-class workmanship and material in the construction of the entire work.

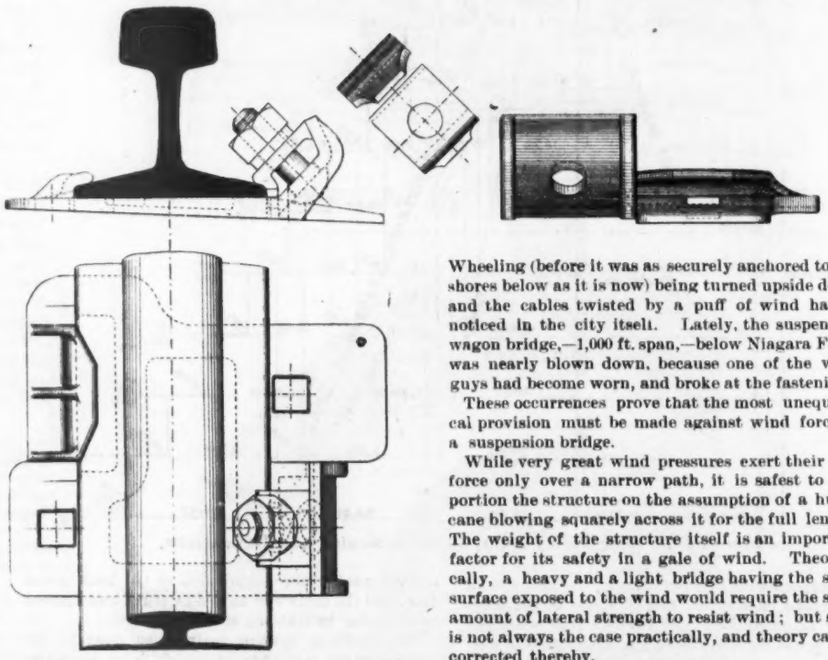
We postpone to next week presentation of details of the waste weir and outlet pipes.

(TO BE CONTINUED.)

The Cox Tie-Plate and Rail Fastening.

The tie plate which we illustrate this week is the invention of Mr. H. F. Cox, Assistant Engineer, Motive Power Department, Pennsylvania Railroad. It is intended to provide not only a better bearing for the rail, and to prevent the cutting of the tie by the rail flange, but also to provide a more efficient fastening of the rail than that afforded by the ordinary method of spiking. The plate is of malleable iron, about 8 ins. long by 9½ to 10 ins. wide; the thickness varies from ½ in. to ⅝ or ¼ in. The dimensions may be varied according to the width of the rail flange and the width of the ties used. The plate is secured to the tie by two ordinary spikes, driven one on each side of the plate. One side of the rail flange is held by a lug or jaw on the plate, while the other side is held by a loose clamp secured by a bolt inclined toward the rail at an angle of about 45°, the nut being on the side next to the rail, and the lead on the outer side of the lug on the plate. A projection on the clamp fits into a recess in the plate at the side of the rail flange, the clamp thus taking the lateral thrust of the rail. The arrangement is clearly shown in the illustration.

It will be noticed that the plate has an inclined seat for the rail, giving the rail an inward inclination, as in European railway practice. In regard to this point Mr. Cox says: "The purpose of the cant or inclination of the rail seat is to give the rail an inward inclination, so as to give (which it practically does) relief to the side of the rail against which the flange of the wheel works, making up also for the coning of the wheel. It is the intention to bring the gauge side of the rail almost to a perpendicular line. The rails of course could be made with an inclined head, but



The Cox Tie-Plate and Rail Fastening.

there are practical objections which could be urged against this."

In the last statement Mr. Cox is, we think, in error. Certainly no such "practical objections" were advanced in the voluminous responses to the circulars of inquiry of the Am. Soc. C. E. Committee on Form of Rail Sections (ENGINEERING NEWS, June 22, 1889), where the vote was 43 to 8 in favor of vertical sides and such sides were recommended by the committee.

The same arguments which favor a vertical side, however (keeping the lower side of the head away from the flange as long as possible), favor the slight cant shown in the cut, which has the further advantage that it creates a slight horizontal component tending to resist the outward thrust of the flanges, and on the whole it seems probable that this slight cant is desirable, although its original purpose, to give a coned wheel a bearing on the center of the rail head, is no longer of much importance, since coning of the bearing part of the wheel tread has all but disappeared.

That tie-plates have come to stay, and that their use is tending to rapidly multiply, becomes every day more evident, and it needs no long study to see that this tie-plate has much to commend it. We understand this tie plate is to be given a thorough test on the Pennsylvania Railroad, after which the question of its general use will be determined. It is also being tested on other lines.

The plate is manufactured by the McConway & Torley Co., of Pittsburg, Pa., who also manufacture the rail joint designed by Mr. Cox, which joint was described in ENGINEERING NEWS, April 21, 1888.

The Economic Conditions of Long-Span Bridges with Special Reference to the Proposed North River Bridge at New York City.

(Concluded from page 465.)

WIND PRESSURE.

So far we have considered only the effects of vertical forces or loads upon bridges; but they must be made secure also against lateral forces, of which wind pressure is the greatest. Indeed, it would be very bad engineering which should not take into account the tremendous effects of gales on the large and exposed surface of a 2,850 ft. span. We have records of wind pressure lifting a heavy locomotive off the track and carrying it about 50 ft.; of a 250 ft. span double-track bridge having been torn from its anchors on iron piers, and lifted and thrown into the river; of the large 1,100 ft. suspended span at Wheeling (before it was as securely anchored to the shores below as it is now) being turned upside down and the cables twisted by a puff of wind hardly noticed in the city itself. Lately, the suspension wagon bridge,—1,000 ft. span,—below Niagara Falls, was nearly blown down, because one of the wind guys had become worn, and broke at the fastenings.

These occurrences prove that the most unequivocal provision must be made against wind force in a suspension bridge.

While very great wind pressures exert their full force only over a narrow path, it is safest to proportion the structure on the assumption of a hurricane blowing squarely across it for the full length. The weight of the structure itself is an important factor for its safety in a gale of wind. Theoretically, a heavy and a light bridge having the same surface exposed to the wind would require the same amount of lateral strength to resist wind; but such is not always the case practically, and theory can be corrected thereby.

It has already been mentioned that a suspension bridge is in stable equilibrium as compared with the unstable equilibrium of an erect arch. This distinction has an important bearing on the sensitiveness of the structure against lateral forces, against lateral rigidity.

The weight of an erect arch in a vertical plane has no significance and no influence against wind pressure; whether it were of wood or iron, it would topple over in either case with the same ease if not specially braced. It is different with a suspended structure. The wind pressure, trying to displace it, is resisted by its own mass and weight, and the moment the lateral forces cease, it will return of its own accord to its position of equilibrium. The wind pressure, if not counteracted otherwise, could push the suspended structure only a certain small distance out of the vertical, and there it would stop. The greatest danger is with the wind striking the bridge from below and lifting it. This danger will not exist in the North River Bridge, because of its great weight, of the rigidity of the structure otherwise, and because of the open floor of wire netting which will let the wind blow through.

The stable equilibrium of the bridge will be enhanced in the same manner, but in greater degree, as in the Brooklyn Bridge, namely, by inclining the cables toward each other, or by "cradling." While in this bridge, the cables are cradled about 5 per cent., in the North River Bridge, the cradling will be 10 per cent. or twice as much.

Calculation shows that if a wind pressure of 50 lbs. per sq. ft. were exerted against the entire length of middle span, and on all four cables, it would have the effect of displacing the windward cables, with the structure suspended from it, 10 per cent. from the perpendicular; so that the wind-

ward cables would then be in equilibrium without the opposing pull of the leeward cable. The wind bracing to be provided for is then merely that required to prevent the leeward cable from assuming the perpendicular. This reduces the wind bracing to a minimum. It is in the form of horizontal wind cables, two below and two above the platform; they will be very large, nearly 12 ins. diameter, and composed of a number of bundled steel wire ropes.

There is a further arrangement by which these wind cables are kept always taut, independent of temperature changes, which otherwise would cause them to be much slacker in summer than in winter time. At no time will the structure be unprepared to resist a hurricane. It may be so great as to prevent the trains from running over the bridge, but will no more endanger the structure than it would solid ground.

The towers of steel, nearly 500 ft. high, will be so wide in the base and of such rigidity, that the greatest wind force will produce no oscillation.

V.—ERECTION OF LONG SPAN BRIDGES AND ECONOMIC MAINTENANCE.

In the nature of things, very long spans will be over deep navigable channels, or over other places making a support for erection from below impracticable. They should therefore be erectable without falseworks. Such is indeed the case with all the systems economically suitable for very long spans.

The continuous girder, the cantilever girder, the erect arch bridge, all, as before mentioned, can be erected without falseworks if necessary; but in none of them is the erection so convenient and so economical as in the suspension bridge. It is here merely the question of erecting the first wire or wire rope over the towers.

In Roebling's Niagara Railroad Bridge, a small balloon took over the first wire. In the Brooklyn Bridge it was a thin wire rope, which, at the signal of a cannon, was hoisted clear from the bottom of the East River high above the mast-heads, and formed the first connection over the towers.

The cable of parallel wires is then usually built in place, strand for strand, in such exact manner that when finally all the wires are compacted into one solid cable, the difference in their straining is no more, if so much, as if the cables were composed of bars, solidly and carefully fitted and riveted together.

The method heretofore used for making cables in place is somewhat slow and tedious. For the larger cables of the North River Bridge, improvements and preparations on so large a scale will be justified that their completion will be insured in half the time heretofore necessary. Special machinery and accessibility to every part of the strands will make it possible to carry on their construction and adjustment by means of electrical contact and signal apparatus, irrespective of the weather, summer or winter. The degree of homogeneousness obtainable in that way would not be surpassed if, instead of the cable, there should be a solidly forged steel shaft throughout, were this possible. And, assumed that a shaft of such size, with a strength of 170,000 lbs. per square inch, could be made, it would lack the pliability and elasticity of the wire cable, a most valuable quality for the durability and strength of the structure.

How long will such a bridge last? It is an unanswerable question in the present state of our science. If well maintained under the most competent engineering superintendence, there is no reason why it should not last as long as the Egyptian pyramids. They were built of more perishable material than steel and iron, provided iron and steel are kept well painted and free from rust. Rust and man are indeed the only destructive agencies for such a structure. No tornado could blow the structure over. No earthquake could shake it down, unless it were so great that the rock would cave and split, and swallow up the North River. The structure cannot be worn out by traffic, no matter how heavy the locomotives and cars that may be used. The heaviest cannon that could be transported over ground could be transported over the bridge. But let the structure be neglected, let it be assumed that this race and this nation die out and this country be again inhabited by savages, and the bridge would decay, together with the civilization that produced and maintained it.

It is not likely that war between civilized nations would sanction the destruction of such a structure by bombardment. It would be needless, since the river itself could not at the same time be destroyed for communication from shore to shore. Civilized warfare protected the cathedral of Strasburg during the siege of that city; it protected the beautiful and monumental public buildings of Paris. (Their subsequent wanton destruction during the reign of the Commune was accomplished, not by the enemy of the nation, but the enemy of civilization.)

Man is more destructive to structures than decay and rust. The necessity of war may bring about the destruction of large bridges in the future as it has in the past. This may not always be an unmixed evil, if inferior structures are destroyed and rebuilt by grander ones. The taste and desire for architectural harmony is growing, though as yet the standpoint of utility, without regard to appearance, is too prominent in most of our bridge structures.

The majestic grandeur and beautiful outlines of a large suspension bridge must be seen to be appreciated. Whether it be the serene and simple architecture of the Brooklyn Bridge, or the ornamental Buda Pesth Suspension Bridge, with its link-cables, and with its exquisitely proportioned stone towers and its anchorages of finely chiselled masonry, or one of the less noted suspension bridges, no other bridge architecture is more pleasing to the eye than theirs, and the desire for their preservation is instinctive in civilized man.

There is no cause so insidious and so dangerous as rust. The alleged gradual crystallization of iron and steel under strain, which was once assumed as a cause for their wearing out, is a fable unworthy of scientific recognition. There are deteriorating causes at work to weaken the cohesion of those metals, when abused and overburdened with work by unscientific design; but a modern steel and iron bridge is not a structure of that kind.

Keep out the rust, and after thousands of years the structure will yet stand. And if rust, or other causes, should endanger it, there will be engineers to replace the structure piecemeal without stoppage of traffic. It has been done already on a smaller scale with the Niagara Suspension Bridge, and with others. Besides it will not be then the first and only bridge over the North River. Others, and perhaps larger ones, will span the river and connect the shores in the then greatest city, not only of this continent, but of the world, past and present.

Eighty years ago there was on exhibition in the city of New York a model of a proposed wooden bridge, partly cantilever, partly arch, over the East River of 1,800 ft. span. THOMAS POPE, an ingenious and ambitious shipwright, was the designer and originator of the project. He was also the projector of a single-span bridge over the North River, which he describes in quaint verse, from which we quote:

> "Like half a rainbow rising on yon shore,
> While the twin partner spans the semi o'er,
> And makes a perfect whole that need not part
> Till time has furnished us a nobler art."

Since his time this "nobler art" has become a fact, and an exact science enables us to carry out in steel and iron what he proposed in wood, with absolute certainty of result, and of a magnitude that even he, THOMAS POPE, a man far in advance of his time, never dreamed of.

THE RAILWAYS IN BRAZIL may be affected by the recent revolution. Whether the system of Government ownership and operation will be retained by the new republic will probably not be decided until weightier matters of state are settled. At present there are 440 miles of road owned by the State, forming the Dom Pedro Segundo Railway; most of the other lines are owned by English companies holding concessions. The name of the State railway, and of the private lines whose official titles includes royalist names or the word "imperial," will probably be changed to a more republican style.

THE ALASKA SURVEY EXPEDITION was last heard from in a letter dated Aug. 2, from Mr. JOHN E. MCGRATH, chief of one of the parties. The two parties separated at Fort Yukon, 800 miles from the mouth of the Yukon River, on July 2. The party under Chief TURNER went north up the Porcupine, and will winter inside the Arctic Circle, while the party under Mr. MCGRATH kept on up the Yukon, and was camped near the international boundary in August.

Testing the Hardness of Water.

A rapid method for ascertaining the amount of lime and sodium carbonate necessary to soften a hard water has been devised by M. L. VIGNON. It gives satisfactory results in waters which do not contain a large quantity of magnesium chloride or sulphate. He employs a standard solution of lime for titrating the water, using an alcoholic solution of phenol-phthalein as indicator. The volume of lime water added is a measure of the lime required to combine with the free carbonic acid present in the water, and that necessary to convert the hydrogen calcium carbonate and hydrogen magnesium carbonate into insoluble salts. On filtering off the precipitate formed in this way from 100 c.c. of the water under examination, the filtrate is titrated with a solution of sodium carbonate containing 1 gram per litre, phenol-phthalein again being used to indicate the end of the reaction The amount of sodium carbonate required will give the quantity of salts of calcium and magnesium other than acid carbonates present in the water.—*Industries.*

THE NEW SMOKELESS POWDER, according to the report of Brig-Gen. BENÉT, Chief of Ordnance, was possibly invented by an American more than ten years ago. Particulars are not given; but it is stated that an application was made to an officer of the department by a person interested in the invention who was given much encouragement. Notwithstanding this, nothing further seems to have been done by the inventor. Gen. BENÉT is of the opinion that a smokeless powder should be adopted as soon as possible, but he says:

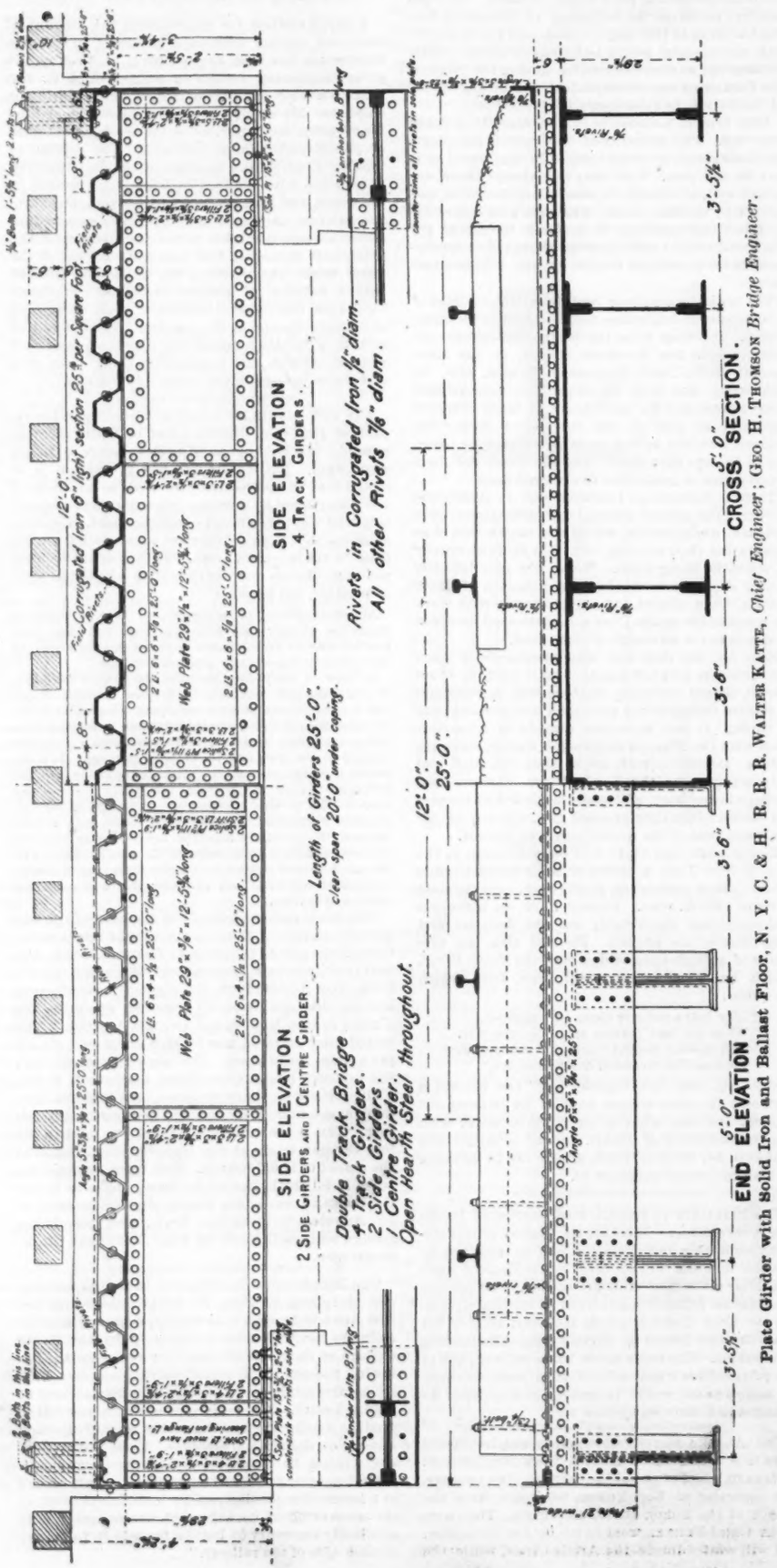
> All effort, official or otherwise, to date, to obtain a smokeless powder has been abortive, and American powder-makers and chemists have not yet awakened to the lucrative opportunity presented to them.
>
> In view of the present status of the powder question, it is not deemed expedient to produce a small-calibre rifle for compressed powder cartridges. Such rifle, however excellent in itself, would be inferior to foreign arms using smokeless powders, and consequently unsatisfactory to the army and the country at large. It is believed, however, that all the elements entering into the problem, except the powder, are ready for use the moment this powder is obtained. A thirty-calibre rod-bayonet Springfield rifle has been made, and a rod-bayonet, thirty-calibre magazine arm is now in progress of construction, in anticipation of the final acquisition of the much-needed powder, so that no time may be lost in presenting for trial both single-loading and magazine small-calibre rifles.

This reads rather curiously in the light of the late positive statement that the inventor of this powder, Capt. LEDYARD ELLSWORTH, of Hartford, Conn., has sold to the German Government, through a certain CARL VON AUDERLITCH, the right to manufacture and use this powder in all countries excepting the United States, Mexico, and Central America. The stated price received was $500,000 down and $10,000 per annum for 99 years. The same report says that the inventor has in vain offered his patents to the United States on the same terms, and that the German agent now offers to buy the remaining territory. This is the same powder that was used in the late German trials at the Hanover sham battle to the extent of 17,000 rounds. This report is given for what it is worth, but on its face it looks as if our Government was again letting slip the product of an American's inventive brain, and permitting foreign nations to profit by what should and might be our own.

OLD IDEAS ABOUT RAILWAYS.—In the Archives of the Nurnberg Railway at Furth, which was the first line constructed in Germany, a protest against railways has been found, drawn up by the Royal College of Bavarian Doctors. In it occurs the following passage: "Travel in carriages drawn by a locomotive ought to be forbidden in the interest of public health. The rapid movement cannot fail to produce among the passengers the mental affection known as *delirium furiotum*. Even if travelers are willing to incur this risk, the Government should at least protect the public. A single glance at a locomotive passing rapidly is sufficient to cause the same cerebral derangement, consequently it is absolutely necessary to build a fence 10 ft. in height on each side of the railway."

Solid Floor Plate Girder, New York Central & Hudson River Railroad.

We continue from last week our illustrations of the New York Central & Hudson River bridge floor and plate girder practice with the accompanying cut of a 25-ft. plate girder, showing a structure which leaves little to be desired in the way of strength and permanency. In our issue of March 23, 1889, we showed a somewhat similar structure with further details of the floor. An incident noted on our editorial page shows how this structure behaved in a late accident.


SIDE ELEVATION
4 Track Girders.
SIDE ELEVATION
2 Side Girders and 1 Centre Girder.
Double Track Bridge
4 Track Girders.
2 Side Girders.
1 Centre Girder.
Open Hearth Steel throughout.
Length of Girders 25'-0".
clear span 24'-0" under coping.
Rivets in Corrugated Iron ½" diam.
All other Rivets ⅞" diam.
CROSS SECTION.
END ELEVATION.
Plate Girder with Solid Iron and Ballast Floor, N. Y. C. & H. R. R. R. Walter Katte, Chief Engineer; Geo. H. Thomson Bridge Engineer.

By the kindness of Mr. George H. Thomson, Bridge Engineer of the New York Central & Hudson River Railroad, we are enabled to abstract from a forthcoming paper by him on "Railway Structural Economics" the following notes as to the good and bad points of such floors, saving the need of further words of ours.

Mr. Thomson classifies metal floors for bridges, referring to railway structures alone, especially railways with heavy gross tonnage, under the following heads.

By a *first-class* floor is meant a solid floor of the type illustrated, meaning, however, not alone the type advocated by him, but all other types which are closed, and in which provision for ballasting is made.

By a *second-class* floor is meant the system of cross and longitudinal girders, used in New York State on lattice bridges for thirty years past, and in most of the current construction in the United States.

By a *third-class* floor is meant wooden floor beams and cross-ties, as commonly used on through and deck plate and lattice bridges.

The phenomenon of "bunching" and "scooping," which occurs with second and third-class floors, cannot obtain with the first-class floors. This is apparent from the drawings.

A derailed train is most admirably provided for in the first-class floor. This is also clear from the drawings, and the chord itself, when there is one, furnishes a base for the various styles of guards to be fastened to.

The danger of fire in first-class floors is *nil*.

The cost of masonry for first-class floor bridges is less than for either the second or third-class floor bridges, for the following reasons:

A. No back wall is required for abutments. These walls, if made of rubble masonry, require frequent renewal, and when of cut work are permanent, and require constant maintenance. If built of cut work, the back wall is an expensive matter, and in short spans the saving in back walls alone will pay the difference in cost between a second and a first-class bridge floor.

B. First-class floor bridges do not shake up the substructure, and second or third class masonry is all that is required in abutments. And old abutments, that will require rebuilding for second-class floor bridges, are often of enough stability and good enough bond to support a bridge with a first-class floor for many years and for some millions of tonnage life. The masonry of a considerable number of bridges upon the line of the N. Y. C. & H. R. R. R., built before and within ten years, is failing under the effects of heavy tonnage. The close spacing of deep cross ties, together with new floor systems on iron bridges, generally precedes such failures. This impact effect is in a measure postponed by the interposition of timber blocking between the sub and superstructure, which requires renewal from time to time, due to crushing; and this work, of course, never ends. The adoption of first-class floors will reduce the maintenance of the substructure, an expensive and growing item, and one that increases rapidly with the growth of traffic. The value of the ballast in a first-class floor bridge, viewed as a dissipator of impact, is recognized generally; the friction between each individual piece of ballast absorbs (so to say) the percussion due to the passage of trains, and the abutment load reactions are in the nature of a dead load. The mass of the ballast, taken together with that of the bridge proper, presents some considerable resistance to the action of external forces; especially is this the case, where the metal is well disposed with reference to the work to be done; the bridge is then a structure, not a machine, and not easily set in motion. Hence there is little or no metallic deterioration, and hence the stresses which the strain sheets show, as required by Act of Legislature, will approach quantitatively, perhaps, within some 20 per cent. or so of the magnitudes assumed.

First-class floors are often for economical reasons, relating to first cost, desirable floors to build, because they are often the cheapest.

In cases where the possible thickness of the floor is limited, the solid floor is cheaper than any form of second-class floor.

The case shown [of the Oriskany Bridge, shortly to be published] would require a second-class floor to be so deep as to sink it below the surface of the creek, and thus destroy the efficiency of the clearance; a bridge of longer span, with five trusses and thin floor, giving the requisite opening, will cost much more than the present structure, while local conditions present a raise of grade.

The approaches to a bridge, being well ballasted and drained, furnish an elastic medium for the passage of a heavy tonnage, which can be maintained at all seasons of the year; and the ballast upon the bridge presenting nearly the same elastic resistance, the axles will experience no shock when entering and leaving the bridge, as always occurs at present when the ballast is succeeded by closely spaced cross-ties resting on the back

walls, as with the second-class bridge floors now so widely used.

PUBLICATIONS RECEIVED.

—*Maps of the Collieries and Coke Regions around Pittsburg, Pa.* By A. Y. LEE, Architect and C. E., Pittsburg, Pa.

A small portfolio containing one map and three bird's-eye views, one of which is a view of the Conemaugh Valley, which was the scene of the Johnstown disaster.

—*Safe Building.*—A Treatise giving in the simplest form possible the Practical and Theoretical Rules and Formulæ used in the Construction of Buildings. By LOUIS DE COPPET BERG, F. A. I. A., Assoc. Am. Soc C. E. Boston: Ticknor & Co. 8vo. pp. 271; 25 folding and other tables; 150 cuts.

A volume intended as an architectural Trautwine, which we shall review more fully later.

—*Illustrations of the Spires and Towers of the Mediæval Churches of England*, preceded by some Observations on the Architecture of the Middle Ages and its Spire Growth. By CHARLES WICKES, Architect. 3 vols. in 1. Boston: Ticknor & Co. Large 4to, pp. 39 and 71 large plates.

This superb work, a rearranged American reprint of an English publication, practically exhausts all there is to be shown within the scope of its subject matter, and should be invaluable for architects.

—*The Official Railway Guide* has published and sends free to all subscribers for the year 1889 an excellent railway map of the United States, cloth edged and mounted on rollers. The map is 38 x 52 ins. in size and is drawn on a scale of 64 miles to one inch. It has been corrected pretty carefully, and shows most of the railways built in 1888. *The Official Guide* is without doubt the largest and most complete publication devoted to railway time tables in existence. We are glad to note this instance of enterprise on the part of its publishers.

—*The New Omaha Bridge.*—This is the latest of the excellent and full reports on great bridges, made by GEO. S. MORISON, C. E., the Engineer of the Bismarck and Plattsmouth Bridges.

The volume comprises 28 pages of text divided into the following subjects: (1) Preliminary Narrative; (2) General Description; (3) Substructure; (4) Superstructure; (5) Approaches; (6) Cost. The Appendices giving tests of Engineers, Employers, and Contractors; Masonry Specifications; Record of Sinking Caissons; Time; Cost of Foundations; Specifications for Superstructure; Tests of Full-Sized Eyebars. Then follow 26 plates 12½ x 17 ins. in which are shown the general elevation and plan and all the details of the various parts of the bridge. The volume is a very desirable addition to the library of any bridge engineer or contractor for bridges. The number to be sold is limited to 200 copies, and as experience with the Bismarck Bridge Report showed this will take about one month to accomplish, it is well to secure this valuable report by ordering at once. It is advertised elsewhere.

—*Proceedings of the Twenty-third Annual Convention of the Master Car Builders' Association.* Held at Saratoga, N. Y., June 25-27, 1889. JOHN W. CLOUD, Secy., 8vo., pamphlet, pp. 252, 17 folding plates. $1.50.

The reputation of the Association is well maintained in this report, the first issued under the management of the new Secretary. Most of its contents we have long since abstracted and reviewed. The most interesting new matter is the report of the late Secretary, Mr. M. N. FORNEY, reviewing the progress of the Association since 1832. The resolutions reported by a committee on his retirement justly states that, "The M. C. B. Association is under greater obligations to Mr. M. N. FORNEY than to any other one man for its elevation to the position of confidence and usefulness it now holds in the railway world."

TRADE PUBLICATIONS.

—*Steam Pumps.*—Illustrated Catalogues of the Hall Steam Pump Co., of New York and Pittsburg. Size, 6¾ x 5¼ ins.; 48 pp.

This is a neat little pamphlet containing descriptions and illustrations of the Hall duplex pump for various purposes; fire pumps, compound pumps, patent hydraulic pressure pumps, outside packed plunger pumps, well engines, power pumps, boilers, etc. Tables of sizes and prices are given, with a page of "useful information." The company has recently established new works at Pittsburg.

—*Catalogue of Rubber Belting and Hose*, Boston Woven Hose Co.

This catalogue opens with a reprint of Mr. FREEMAN'S excellent report to the Associated Factory Mutual Insurance Co. on "The Quality of Linen Fire Hose," the substance of which was republished some months since in their columns, being of real technical value. It is the best possible evidence that the manufactures of this well known company are intended to be fully up to the high standard set in that report.

SOCIETY PROCEEDINGS.

The American Society of Civil Engineers.—Meeting of Nov. 19, Vice-President A. FTELEY presided. A paper on "The Results of Investigations Relative to Formulas for the Flow of Water in Pipes," by Mr. EDMUND B. WESTON, was read by the Secretary. This paper describes the experiments of the last century in the investigation of the flow of water in pipes, arranges the results, and from them deduces a new formula for the flow in very smooth pipes up to diameters of 3½ ins. The paper is the result of long-continued and intelligent investigation and comparison of results, and contains an immense amount of matter useful to hydraulic engineers, compressed into smaller compass than ever before presented. The subject was informally discussed by Mr. RUDOLPH HERING, Mr. JOHN R. FREEMAN, and Mr. CHARLES E. EMERY. The first two speakers both questioned the practical value of the new formula presented, owing to its very limited range, and pointed out the danger of evolving a formula that might mislead the careless engineer, instead of simply presenting tables and diagrams of curves, which would exactly define the conditions of use.

Mr. HERING called particular attention to the great effect of the skin-friction in pipes upon the flow of water, and insisted that all formulas of this character should contain a "factor of rugosity," or a variable quantity that should as nearly as possible indicate the relative smoothness or roughness of the interior of the pipe experimented upon. The speaker stated that under certain conditions this element of the skin friction had even a greater influence upon the flow than very appreciable differences in pipe diameter. Both Mr. FREEMAN and Mr. EMERY stated that many more experiments must be made in which the exact conditions of the pipe interior was a vital part of the record before the true value of the eddies caused in the fluid by inequalites of perimeter could be intelligently formulated. It seemed to the speakers that until these exhaustive experiments were concluded and carefully studied, the present formula of Mr. KUTTER, cumbersome and imperfect in coefficient value as it was, was yet the most rational formula in use; for it did consider this quality of pipe roughness as an important element in obtaining results.

Engineers' Club of Kansas City.—A regular meeting was held Nov. 4; Vice-President BREITHAUPT in the chair, 8 members and 7 visitors present.

The Paper on "Building Stones," read Oct. 7, was discussed by Messrs. G. W. PEARSONS and THOS. KNIGHT.

A short article, from Mr. F. E. SICKELS, on "Sewer Ventilation," and one on "Sewage Disposal," by K. ALLEN, were read by the Secretary and discussed by Messrs. G. W. PEARSON and T. KNIGHT.

A paper from Prof. L. M. HAUPT on "A Plan for Outer Harbor off Padre Island, Tex.," was read by the Secretary; also a letter from Mr. A. BONZANO, endorsing the project; and a paper by Mr. JOHN WILLETT, on the commercial aspect of such an harbor, was read by the author, illustrated by designs and coast survey charts. The plan contemplates building an iron pier out into the Gulf 4,500 ft. from shore, then constructing wharfage sufficient for 30 of the larger ocean vessels and 200 sail of coasters. He considered this plan more practicable and wise than to attempt to maintain a channel through the bar that guards entrance to the entire Texas coast. The plan could be carried out in 30 months, and the case of Ceare, Brazil, was cited, where a similar outer harbor, 7,000 ft. from the shore, is an absolute realization of all expectations.

KENNETH ALLEN, *Secretary.*

American Society of Mechanical Engineers.—At the annual meeting in New York this week the following officers were elected: President, OBERLIN SMITH, of Bridgeton, N. J.; Vice-Presidents, JOEL SHARP, of Salem, O.; GEO. W. WEEKS, of Clinton, Mass.; DEVOLSON WOOD, of Hoboken, N. J.; Treasurer, WM. H. WILEY, of New York; Managers, J. E. DENTON, of Hoboken, N. J.; C. W. NASON, of New York; H. H. WESTINGHOUSE, of Pittsburg, Pa.

Western Railway Club.—At the meeting on Nov. 19, a paper was read by E. C. CASE of the St. Louis & Hannibal Railway on "Best Metal for Brake Shoes." This he defined as that metal which will produce the greatest friction in a given time by the application of a reasonable pressure. Such a metal should be soft and tough. Brake shoes of hard metal will not "hold" as well as brake shoes of soft metal. Heating from the application of brakes was referred to as a frequent cause of loose tires, softened wheel-treads, cracks in chilled wheels and hardened steel tires. It was also stated that the wear on the brake shoe was greater in proportion to the friction as it became heated.

"If friction could be produced without heat, we would avoid all the undesirable effects arising from the application of the brake shoes. This cannot be done, but this heat can be held in check."

Mr. CASE then propounded the following extremely novel theory regarding the wear of brake shoes:

"Heat begins to travel and is continually in motion from the time it is generated until it disappears. Philosophy teaches that when two metals come together in frictional contact, a separate and distinct current is set in motion in each, one traveling in opposite direction to the other, and contrary to the movement of the body in which it circulates. There is also another movement of this heat, namely, the absorption of heat by the atmosphere; otherwise it would be absorbed as fast as generated.

"With the first revolution of the wheel the heat and friction are commensurate, but with each succeeding revolution the heat is accumulated, and this accumulation is in multiples, less the amount of radiation, which, increasing with the accumulation, finally equals the generation. A part of this radiation, however, goes to the wheel instead of the atmosphere, the wheel, being the larger body, keeps cooler in proportion than the brake shoe, and iron being a better conductor than air, it necessarily absorbs a portion of the radiation from the shoe. Hence any device that will keep the temperature of the shoe down will likewise affect the wheel in proportion. To hold this heat in check it is necessary to destroy, as far as possible, the conducting properties of the shoe. We find that this can be done by inserting in the face of the shoe a soft metal or alloy, which being a very poor conductor of heat, has the effect of breaking the current, and the temperature of both shoe and wheel are thus held nearer normal, and in the proportion that this is done the wear of the shoe and wheel is reduced, and the undesirable effects, the cause of which has heretofore been traced directly to the high temperature of the shoe and wheel, are avoided.

"We have made some tests for the purpose of determining to what extent this heat could be held in check, with the following results:

"Under additional circumstances the actual heat generated in a cast-iron shoe was 500 degrees, or nearly four times that of the composite metal shoe, which was 145 degrees, and in the wheel under the cast-iron shoe, 195 degrees, or more than double that of the wheel under the composite metal shoe, which was 95 degrees. The normal temperature at this time was 65 degrees, which should be added to the above figures to obtain the actual temperature reached by each. We have also made many stops with the composite metal shoe in comparison with the cast-iron shoe, in which we found that we could stop in as short time and distance as with the ordinary cast-iron shoe.

"We have made some preliminary stop tests with cast and wrought shoes to determine the relative friction and wear under varying circumstances, and while as yet we have no accurate statistics to offer, we have learned enough to convince us that practice will demonstrate the truth of the foregoing statements.

"We have found that the wear of the cast-iron shoe is greater as the heat rises, without any increase in friction, and have also found that the wrought shoe will show much less wear than the cast shoe, but at the expense of far greater wear on the wheel, so much as to be an impracticable metal for brake shoe purposes.

"We then recommend a soft cast-iron shoe, with a softer metal than the body inserted in its face."

The remainder of the proceedings we postpone to our next issue.

American Society of Mechanical Engineers.—Annual Meeting. The meeting opened by an evening reception at the new rooms of the Society, No. 64 Madison Avenue, Nov. 18. The attendance was large and the occasion in every way enjoyable.

The business sessions opened the next day at the rooms of the New York Academy of Medicine, No. 12 W. 31st St., about 130 members being present, with an address by the retiring President, Mr. HENRY R. TOWNE. Mr. TOWNE stated that as the President was entirely free to choose his own subject, his address would be divided into three parts, an account of the joint excursion of engineers to Europe, some remarks as to the proposed world's fair and an account of the status of the Society. The circumstances of the European trip, and the cordial reception which the engineers everywhere met, were recounted with considerable fullness, as they have been already reported in these columns. The salient feature of the remarks as to the world's fair was a very emphatic statement, corresponding with the view we have repeatedly expressed, that it was utterly out of the question to hope to open a worthy world's fair, whatever its site, in the spring of 1892; and that the engineers of the country should emphatically express this opinion. At least a year's, possibly two years', postponement was necessary if the exposition was to have any dignity and artistic unity, although a vast and ugly miscellaneous show could no doubt be got together in less time. The preliminary steps for the Paris Exposition, with its large experienced staff, were taken 4½ years before it opened, and the actual work of construction occupied 30 months. There now remained only 29½ months before May 1, 1892. "The exposition of 1876 educated us, and we should in turn have an exposition that will educate foreign nations," one distinctly grander than any preceding. The standard should not be lowered by any mere sentiment in regard to 1892. It is our duty to tell our countrymen our need of more time, regardless of where the exposition is held. This, the first of the great expositions to be held at a seaport, should be correspondingly grand and unique.

The average admission fee at Paris was about 10 cts. equivalent to 30 cts. here. The average attendance had been 125,000 per day, or some 25,000,000 in all, the average on Sunday 300,000, and the maximum of any one day 405,000. There was 72 acres of floor space. The 1892 exposition should have 85 to 100 acres of floor space, and was likely to have 30 to 40 millions of visitors if held in New York. Striking a radius of 500 miles, or any other, like distance, was a very poor method of determining the actual probable attendance. The important question was the population within an hour or two of the site. The estimates of the money spent in Paris in con-

sequence of the world's fair varied from $250,000,000 to $358,000,000.

The Society was congratulated on its vigorous growth. It was organized in February, 1880, and by the end of the year had 189 members. Its growth since was shown as follows, by contrast with the two other leading societies:

	Am. Soc. M. E.	*Am. Soc. C. E.*	*Am. Inst. M. E.*
1880	189	611	843
1889	1,049	1,280	1,986
Growth, 9 years	860	669	1,143

In all, there were over 4,000 engineers connected with these societies, besides those connected with the many local societies. While these subserved an excellent local purpose, it was greatly to be hoped that some plan might be devised by which they would be converted into chapters or sections of a national society, and it was still more to be desired, and might reasonably be expected, that there would be some organization before long to include the best of all the societies.

The President's address, which was about two hours long, was well received throughout, and greeted with loud applause at its close.

The report of the Council was then read. Of the 1,049 connected with the Society, 887 were Members, 17 Honorary Members, 48 Associates, and 97 Juniors. Only 7 meetings of the Council had been held the past year.

The treasurer's report showed $13,585 receipts, the expenses being about the same. For printing and stationery, postage, etc., $1,197 was expended, and for publications, $3,521. The salary account was $3,164. 180 members were voluntarily contributing $2 each to the library.

The Committee on Uniform Tests and Test Pieces promised to report in full at the next meeting and reported much work done. The Committee on Standards submitted the following report:

We, your committee appointed at the Erie meeting to take under consideration the subject of a Governmental Bureau for the Record of Standards, beg leave to report as follows:

First. We give our earnest recommendation to the project, and advise that it is a subject to which the Society can with propriety lend its utmost aid and encouragement.

Second. We present herewith a resolution looking to the appointment of a committee to further the matter of congressional legislation on the subject, and looking also to practical operations under the legislation in case the same should be secured, and we recommend the passage of the resolution.

Third. We present herewith a resolution giving the Society's approval of the installation of such a Governmental Bureau, the object of this latter resolution being to provide the above committee with the Society's endorsement of the project, and we recommend the passage of the resolution.

Fourth. We present herewith the draft of an Act of Congress looking to the establishment of the desired bureau, and suggest substantially such an Act as the basis of operations of such committee.

Respectfully submitted,
JAMES W. SEE, COLEMAN SELLERS, OBERLIN SMITH.

The following resolutions were submitted by the committee and adopted:

1. That a committee of three be appointed by the President, such committee to be known as the Committee on Standards.

2. That when, from any reason, vacancies arise in such committee, the President shall, on notice thereof, fill such vacancy by appointment under the Rules.

3. That it shall be the duty of such Committee on Standards to use all reasonable efforts to secure such congressional legislation as will provide a Governmental Bureau of Record wherein may be entered respectably recognized and approved Standards, for the promotion of uniformity in the products of the arts, in technical customs, and in nomenclature.

4. That in the event of such legislation being secured and such bureau provided for, it shall become the duty of such Committee on Standards to file, on behalf of this Society, applications for the entry of such Standards as the Society may hereafter from time to time approve;

5. That properly certified bills for postage and stationery, incurred by such Committee on Standards in its efforts to procure congressional legislation herein looked to, be paid out of the funds of the Society.

The following resolution was offered by the Committee and after being held over two days for consideration, adopted:

That in the opinion of this Society, having about 1,000 members engaged in the manufacturing industries of the country and in allied professional pursuits:

1. The time has arrived when practical Standards of uniformity based on a common understanding are essential to industrial business and professional pursuits.

2. A large number of practical Standards of respectable recognition and approval are now in use but without uthentic record.

3. Systematic procedures in the matter of recording uch approved Standards would tend toward the inauguration of many other greatly needed Standards, tending toward uniformity and interchangeability of merchantable products, in improved codes and signals, and in scientific nomenclature.

4. Provision should be made, under governmental auspices, for a place of record for Standards having respectable recognition and approval.

The form of bill submitted by the Committee we shall give in full next week, as it is a subject which concerns and interests all engineers.

A proposed amendment to Articles 20 and 21 of the Rules, presented at the Erie Meeting under Rule 45 and to be acted on at the Annual Meeting, was then submitted to viva voce vote and passed:

ARTICLE 20.

The affairs of the Society shall be managed by a Council, consisting of a President, 6 Vice-Presidents, 9 Managers and a Treasurer, who shall also be the Trustees of the Society.

All past (ex) Presidents of the Society, while they retain their membership therein, shall be known as Honorary Councilors, and shall be entitled to receive notices of all meetings of the Council and may take part in any of its deliberations; they shall be entitled to vote upon all questions except such as affect the legal rights or obligations of the Society or its members.

ARTICLE 21.

The members of the Council shall be elected from among the Members and Associates of the Society at the annual meetings, and shall hold office as follows:

The President and the Treasurer for one year; and no person shall be eligible for immediate re-election as President, who shall have held that office for two consecutive years; the Vice-Presidents for two years, and the Managers for three years; and no Vice-President or Manager shall be eligible for immediate re-election to the same office at the expiration of the term for which he was elected.

The reading and discussion of papers was then taken up, report of which we must postpone to next week. The following is a list of the papers, and of the further excursions and receptions:

On Tuesday, Nov. 19: "Properties of the Vapor of Water," by V. DWELSHAUVERS-DERY; "Theory and Design of Chimneys," by HORACE R. GALE; "Philosophy of Multiple Cylinders or Compound Engines," by R. H. THURSTON; "Flow of Steam through Orifices," by C. H. PEABODY; "Experimental Study of the Different Types of Calorimeter," by C. H. PEABODY; "Cost of Lubricating Car Journals," by L. S. RANDOLPH; "Steam Pipes for Collieries," by E. F. C. DAVIS; "Rolling Steel Rails," by D. K. NICHOLSON; "Methods of Reducing the Fire Loss," by C. J. H. WOODBURY;

In the evening of Nov. 19, a subscription dinner took place at Clark's restaurant, No. 22 W. 23d St., which was largely attended by members and ladies accompanying them.

On Wednesday an excursion was made to the Government instruction and proving ground at Willett's Point, stopping at other points of interest. In the evening of the same day, by invitation of the Board of Managers of the Engineers' Club, No. 10 W. 29th St., a reception was tendered to the visiting members at their club house, beginning at 8.30. A collation was served later in the evening, and the occasion was most enjoyable and largely attended.

On Thursday, Nov. 21, the papers were:

"Indicator Rigging for Compound Engines," by FRED. W. PARSONS; "A New Recording Pressure Gauge," by W. H. BRISTOL; "General Solution of the Transmission of Force in a Steam Engine," by D. S. JACOBUS; "Street Railway Car Gear for Modern Speeds," by S. J. MACFARREN; "The Comparison of Indicators," by J. BURKITT WEBB; "The Cards from the Pawtucket Pumping Engine with and without Jacket," by JAS. E. DENTON; "How to use Steam Expansively in Direct Acting Pumps," by J. F. HOLLOWAY; "Cost of Steam and Water Power," by C. T. MAIN; "Graphical Analysis of Reciprocating Motions," by OBERLIN SMITH:

In the evening the Society's guests and members attended the Fair of the American Institute, by invitation.

On Friday, Nov. 22, a trip was made on the new double-screw ferry-boat *Bergen* of the Hoboken Ferry Co. The party embarked from the slip at Christopher St., luncheon being served on the boat by the courtesy of Dr. HENRY MORTON, of Stevens Institute. While on the boat and before luncheon, Prof. JAS. E. DENTON and Col. E. A. STEVENS presented the final paper of the session, entitled "The Performance of a Double-Screw Ferry-Boat." After the paper and discussion, and concluding business and the visit to the objective point, the convention adjourned, returning about 3 P. M., to permit those of the party who wanted to catch evening trains to do so.

Northwestern Railroad Club.—At the meeting of Nov. 9 a paper was read by Mr. GRIFFIN on car wheels. The paper was devoted entirely to a criticism of the statements made by Mr. J. M. BARR, of the Chicago, Milwaukee & St. Paul, in a paper read before the New York Railroad Club on Dec. 20, 1888. In that paper Mr. BARR described the working of the contracting chill for casting car wheels, invented by him, and the results obtained in practice by the use of wheels cast in the contracting chill.

Mr. GRIFFIN'S paper was devoted to a refutation of Mr. BARR'S statements concerning the benefits derived from the contracting chill, and was intended to prove that as good wheels could be cast with the ordinary chill as with the contracting chill.

Mr. GRIFFIN claimed that hot and fast pouring did not increase the tendency to chill cracks, as claimed by Mr. BARR, and said: "We pour iron as hot and fast as Mr. BARR ever poured iron into contracting chills, and our losses from chill cracks are not 3 wheels in 1,000; in fact, in our last month's report, 8 molders out of 15 averaging over 500 wheels apiece for the month and aggregating over 4,000 wheels, did not have one chill-cracked wheel among them; and further, the balance did not exceed 3 in 1,000, and in every single case we could point to some other reason for the chill crack than hot and fast pouring."

Mr. GRIFFIN also claimed that other defects in car wheels pointed out by Mr. BARR were not to be remedied by the use of contracting chills. He further claimed that according to Mr. BARR'S own figures, the use of the contracting chill was a detriment, rather than a benefit. In proof of his statement he submitted a report of tests made by the Hunt Bureau of Inspection and Tests on wheels cast with the contracting chill and without it.

The summary of the results of these tests was: (1) that pouring the iron slowly into the Barr contracting chill produced a lighter chill on the wheel and a variation in the chill in the throat of the wheel as compared with the center of the tread, (2) that as good a wheel was obtained in the Barr chill without the steam and water as with it, (3) That a wheel poured in the ordinary chill with as hot iron and as rapidly as in the Barr chill produced as good a chill in the throat of the wheel as in the center of the tread as compared with the results obtained with the Barr chill.

Mr. GRIFFIN summed up his position in the matter as follows: "I desire to put myself upon record as never having said that contracting-chill wheels were not as good as, or better than, other wheels. I have not sufficiently analyzed the subject to make a positive statement to that effect, but I have said, and do say, that I believe that I have fairly demonstrated that the use of water and steam in a contracting chill is of no practical value, and that good car wheels with uniform chills in all parts can be made in common chills, and that iron can be poured as hot and as fast in one as in the other; and that so far as concerns the claims specifically made by Mr. BARR for the contracting chills as compared with common chills, I have demonstrated that they were not true."

Mr. BARR was called on by the Chairman and said that he was quite unprepared for Mr. GRIFFIN'S attack. So far as the paper directly or indirectly charged him with dishonesty, he had no reply to make. As to the statements made by him at the New York Railroad Club meeting, those were all correct and straight. The original records are in existence at Milwaukee and are open to inspection by any one who wishes to see them.

He then discussed the tests made for Mr. GRIFFIN by the Hunt Bureau as follows:

"The chill on chill test No. 4, which corresponds with exhibit No. 4, showing a wheel cast in the ordinary chill, is about 1 5-16 in. The depth of white iron on the wheel, measuring at the highest point, is a little over ¼ in. Now that is just exactly what I claim for the contracting chill; that is, that the chill on the wheel is very nearly equal to the chill on the test—that you don't need to make a high mixture, chilling an inch deep on the chill test, to get a good half inch on the wheel; and you all know how much the strength of a wheel depends on the hardness of the metal that is used in forming the body. That is one great trouble with the common chill: you can't use a low, tough grade of metal in the common chill and get a good chill on the wheel. If your chill on the wheel would equal the chill on a block like this, then you could use a lower grade of metal, and make a much tougher and safer wheel. Now, any chill that will put a chill on the wheel equal to that on the chill test—if you could get such a chill—I think you will all agree will make the best wheel. Mr. GRIFFIN makes a point here that in these particular cases steam and water were not used."

Mr. GRIFFIN.—In one, Mr. BARR, of course, in the other it was not. I would like to ask Mr. BARR how he accounts for the fact that the chill on the one which did not have the water and steam is equal to the one that did.

Mr. BARR.—I have simply to say, with reference to that use of steam and water, that I used the chill for a year without steam and water, and got a good wheel; I didn't get as deep a chill on the wheel, as a rule, as on the chill test—in fact, considerably below it. I felt that until I produced a chill on the wheel as deep as the chill on the chill test, there was something failing in the device. I therefore went ahead to devise some method of giving an additional movement of the chill blocks. I presume you all understand the contracting chill. If not, I will make a little sketch here.

(Mr. BARR here drew a diagram on the black-board to illustrate his remarks.)

Suppose that to be a ring of metal of the proper shape on the inside to form this part of the tread of a wheel. That is a car wheel chill. You pour the molten metal against that chill, and a shell commences to form against it. As it forms, the chill becomes heated and expands. The solid, thin shell of metal which forms against there, still continues to cool and necessarily to shrink. The shell on the inside in that way is separated from the chill and the cooling effect of the chill is stopped. That accounts for the fact that in the ordinary chill you don't get as much depth of white iron in the wheel as you do in the chill test.

Now, my first object was, or my first idea was, to destroy the expansion of that chill. I thought I had it then, so I simply cut it in that way all round (indicating) leaving a ring outside here carrying those blocks. I felt then that the metal in here would be sufficiently cool; or in other words that the chilling operation would be completed before the heat could pass through these blocks into the outside ring. That did a great deal of good; but working day in and day out in the foundry, I found that

still the depth of white iron on the wheel was materially less than the depth of white iron on the chill block or chill test. Then the next question was how to improve that. Well, I got quite an elaborate device to make a chuck out here (indicating) that would move all these blocks, 96 of them, in against the wheel as it contracts on the inside. I never made that machine because I found it would be too expensive; so I concluded to take this chill. Now here is a sectional view of the chill (indicating), here is a section of the wheel. I concluded to secure that movement, to a limited extent, by connecting with an outside ring like that. Run these cuts right through the chill; make a little connection. Now, there we have an outside hollow ring that is carrying these chill blocks in the proper position to form the tread of a wheel. To give them motion I pass steam in through here, heating up this ring, and of course as it expands it must carry these blocks with it,and increase the diameter of the inside or chilling surface of the chill. Then when I started to pour the metal, I would turn a current of cold water through this ring that causes these chill blocks to move inward.

Now, it has been said it don't move more than about a twentieth of an inch. What good is that? I know it don't move more than a twentieth of an inch, and I never said that it did. I have tried it a hundred times. I have made a chill with these blocks connected by an arm like that (indicating) and an outside hollow ring there 6 ft. diameter. You can very readily see that that will double the motion of the chill blocks, double the contraction of the chill; and on that chill I had so much contraction that I would squeeze the metal out of the hollow where the single and double plates unite. I concluded that I had more than was necessary. Whether we have or not more contraction than is necessary, the whole thing remains simply this way, that we almost invariably get a uniform chill on the wheel and a chill almost as deep as on the chill test.

Some discussion then ensued between Mr. BARR and Mr. GRIFFIN, in which it was brought out that fast pouring was necessary to gain most benefit from the contracting chill. Mr. BARR also stated that, notwithstanding the results obtained by the single test of the Hunt Bureau, on regular shop work the chills on the wheels cast in the contracting chill, with the use of steam and water, would be 20 per cent. deeper than if steam and water were not used.

The matter of tests for car wheels was then taken up. Mr. BARR said the blow prescribed in the second test adopted by the M. C. B. Association was about equal to the blow struck by a good man with a 30-lb. sledge hammer. He favored strengthening the wheels by improving the quality of the metal, not by adding to the weight, unless the latter was necessary. The foundation did not play a very important part in the case of blows no heavier than those prescribed for the test. If the wheel was laid on a hard wood block set firmly into the ground, he thought the result would be about the same, although the test would be somewhat less severe than if it were laid on an iron ring set on masonry.

"I think that the Master Car-Builders' rules for removing worn wheels are about right for everything except engine truck wheels; and for engine truck wheels it seems to me that the wear should be considrably larger on the flange, because, I presume, the experience of nearly all of you is that the engine truck wheels will sometimes go to the flange. If the wheel is worn below close to the flange, and worn against the flange, I consider it more dangerous than if there was a uniform wear over the surface, and the flange worn pretty well. If there is any sign of wearing through the chill, then the wheel becomes at once dangerous, if it is worn near the flange."

The discussion then turned on to shelled-out spots in wheels. Mr. BARR said they generally occurred in the strongest, toughest wheels. He did not think it necessary to remove a wheel from service on account of them unless they were large enough to make the wheel run too rough on the track. He had never noticed that such spots on wheels had a tendency to break them; but would not be surprised if in very cold weather a wheel with these spots would be more likely to break.

Returning to the proper method of testing,Mr. PATTEE inquired where the wheel should be struck. Mr. BARR said the blow ought to be struck on both the brackets and the plate between. The hammer used by him has a face 6 ins. wide, so that at least one bracket will be struck. Mr. PATTEE thought it should be specified just where the wheel should be struck and the size and shape of the hammer face which should be used to strike the wheel.

New England Railroad Club.—At the meeting on Wednesday evening, Nov. 13, President RICHARDS occupied the chair, and announced as the subject of discussion for the December meeting, "Railroad Signals and Signalling," to be opened by Mr. R. H. SOULE, of the New England Switch Co. The subject of the meeting then assembled, "Journals and Journal Bearings," was announced, and a paper was read by Mr. F. D. ADAMS, of the Boston & Albany, who said:

Most of us agree that the present oil box for journals of cars is a crude arrangement, admitting dust and grit, and allowing the oil, in a limited degree, to escape, thereby subjecting trains to frequent delays on account of hot boxes.

Now, what is to be done to remedy this particular trouble in our cars? Better oil or grease, better waste, and better bearing may help to obviate the trouble; but you may rest assured, that with our present oil box and small amount of bearing surface, we must continue to expect hot boxes with our increased loads on our small journals.

Again, most of our trucks are so imperfectly and carelessly constructed that with the very best oil, waste and bearing, they would get hot. What we need to insure us against hot journals is good stock, as stated above, and good mechanism in construction. We certainly need an oil box tighter than our present standard, with its open back and crude dust guard, which is soon worn so that every lateral movement of the axle pumps in a quantity of dust, filling the waste with grit, and causing the brass to wear very rapidly. There are boxes that are comparatively oil and dust-tight. Why not use them? Possibly the principal objection is the additional cost; but we cannot have a good piece of mechanism or a suitable oil box without its costing more than our old standard.

I believe we ought to have, and I am inclined to think that we soon shall have, a box for our passenger service that is absolutely proof against heating at any speed, but it will cost more money. I believe we should have a box for freight use that is cheap and much tighter at the back part of the box, and also the cover fitted properly, so it will fit close and stay where it is placed. I also believe the time is not far distant when there will be some kind of an anti-friction bearing for car journals of the roller or ball type, that can be produced at a reasonable cost, that will soon supersede all of our old-style bearings, lessening the amount of oil, and doing away entirely with waste, and reducing the friction to a very small per cent. of what it is now.

Mr. LAUDER.—I have during the last three years watched the matter of journal bearings very closely, and I am more than ever convinced that the one thing of all others needed to improve our practice in journal bearings is a dust-proof box; it is of more importance, I think, than the material or design of journal bearing. Our present journal bearings would give us a great deal better service if we could exclude the dust and other foreign matter that enters the boxes at the end of the journal next to the wheel. We run over a section of country in parts as difficult to operate with freedom from hot bearings about the engines and cars as perhaps any place in the country. That is on Cape Cod, where we run through sand for 50 or 60 miles. When it is dry, under the cars there is a whirl of sand, and I have seen cars come into Boston with at least a quarter of an inch of sand lying on the truck-bed. Under those circumstances it is absolutely necessary to have appliances to exclude that sand from the journals, and three years ago I equipped two cars with the Bemis box, which is practically dust-tight. I did what perhaps others did not do at that time, I insisted on having a larger journal; I started with a 4-in. journal. Those boxes are running at the present time on that journal; and they have given so much satisfaction that we shall use these boxes on our new equipment, with a 4¼-in. journal. I believe the larger the journal, the less the friction, the less the necessity for repairs, the less the liability to heat.

I had a journal at the M. C. B. Convention last June that had run over 150,000 miles, and was within 1-64 in. of its original size. That shows what can be done if you can exclude foreign matter. I suppose in lubrication the theory is that a lubricant prevents the absolute contact of the two surfaces. If that is correct, and foreign matter like dust and grit can be entirely excluded, theoretically there ought not to be any wear. Now there is wear, which shows that foreign substances get between the two surfaces and abrade them. The best box that I have yet seen to exclude grit is the so-called Bemis box. Formerly with the ordinary box, it was a rare thing on our Cape Cod division for an axle to be used with a second pair of wheels, because the journals were worn out. In fact, in some cases we have put under a pair of wheels with new axles, and had to remove them before the wheels were worn out, chilled wheels, because the journals got below the safety point. Wheels in that section rarely make over 30,000 or 40,000 miles. We have journals with the Bemis box that are now wearing out their fourth pair of chilled wheels.

I have here a record of some tests which I have been making during the past year. I don't propose to let anybody use this record to advertise their boxes, or to injure any other man's box, so I will not mention by whom these boxes were made, except that one set was made by the Old Colony R. R. The other three sets, two of each kind, were of different manufactures.

They made over 36,000 miles. Of the four kinds of bearings, three of them were with soft lining and one was a solid brass box without any lining, and they made almost exactly the same record, giving almost exactly the same results.

The general condition of all the journal bearings and journals at the end of the test was good. Bearings Nos. 7 and 8 were made in the Old Colony shops.

Report of Four Pairs M. C. B. Standard Journal Bearings, in service from Oct. 1, 1888, to Oct. 1, 1889, on Old Colony Smoking Car 83. Mileage, 36,877.

Mark.	Weight, Oct. 1, '88.	Weight, Oct. 1, '89.	Loss of Wt. in ozs.	Mileage to 1 oz.	Oct. 1, '89, Diam. of Journal.
1	9 lbs. 7⅛ oz.	6 lbs. 11 oz.	44⅛	859	3 45-64 ins.
2	9 " 10⅛ "	6 " 12⅛ "	46	802	3 45-64 "
	19 " 2 "	13 " 7⅛ "	90⅛	815	
3	9 " 8 "	7 " 9⅛ "	30⅛	1,289	3 46-64 "
4	9 " 9⅛ "	6 " 10 "	47⅛	776	3 44-64 "
	19 " 1⅛ "	14 " 3⅛ "	78	992	
5	8 " 13 "	5 " 13⅛ "	47⅛	776	3 47-64 "
6	8 " 7 "	5 " 7⅛ "	47⅛	776	3 47-64 "
	17 " 4 "	11 " 5 "	95	776	
7	9 " 8⅛ "	7 " 13 "	27⅛	1,341	3 46-64 "
8	9 " 10⅜ "	6 " 12 "	46⅛	793	3 46-64 "
	19 " 3 "	14 " 9 "	74	1,067	

The original diameters of the journals were 3 48-64 ins. It will be noticed that the wear on journals Nos. 1 and 2 was 3-64 of an inch. In some cases the journals when taken out were slightly tapered; we expect more wear at the end of the journal next the wheel than at the other end. Most of the wear is due to the dust getting in there. In some cases there was a slight difference, perhaps 1-64 of an inch, and in that case we measured both ends, taking the mean as the diameter of the journal. In Nos. 7 and 8 the two journals were exactly alike, losing 2-64 of an inch. Those had boxes made in our foundry, Nos. 5 and 6 had solid brass boxes.

It will be noticed that No. 7 made 1,341 miles to the ounce, while No. 8 made only 793. They were on different axles, on the same side of the truck.

The car was new, and also the truck frames, the boxes all new. They were treated as nearly alike as possible during the experiment, and at the end of six months the journals and boxes were removed and a table made up like this, showing practically the same results. The boxes were all cleaned and repacked and then run six months longer.

This experiment was made to ascertain the relative value of four different kinds of bearings. The solid brass makes the poorest showing; the other three kinds were all lined bearings, but they are very near together in the results obtained.

Mr. ADAMS showed a brass taken from a sleeping car fitted with his boxes which had made 101,000 miles and was only half worn out. The three sleepers from one of which the brass was taken had run 15 or 16 months and not one had ever had a hot box. The ordinary M. C. B. brass would run in the M. C. B. box about 75,000 miles with fair treatment. Many would not exceed 60,000 miles. With the Adams box end wear is almost entirely obviated. Mr. ADAMS praised the Bemis box, the only objection to which, he said, was its excessive cost. The Adams box can be had for one-tenth the cost of the Bemis.

Mr. GEO. R. MENEELEY described the roller bearing invented by him and in use on some Delaware & Hudson passenger cars. One car now running between Troy and Binghamton has run 42,000 miles and is on its second year. At least 100,000 miles is confidently expected with this bearing. The all-important point in a roller bearing, said Mr. MENEELEY, was the means employed to separate the bearing rolls, and keep their axes exactly parallel to the axis of the journal. In the bearing invented by him there is no sliding friction whatever, and no oil is required.

Mr. CHAS. H. SHATTUCK described the Tripp journal bearing. About 20 cars are now running in New England, fitted with this device. One running on the Washington express on the New York & New England makes 381 miles each night, and has now run over 55,000 miles without losing a trip.

Mr. MORDEN related an experience with roller bearings about four years ago, when three or four cars under his charge were equipped. The bearings ran well for about six months and then failed up. He thought that for five years, and perhaps for twenty five, how to get the best service from bearings of the ordinary type would be the point of chief interest. He thought for each ounce of wear on the brass at least 12,000 miles should be run. Protection from grit and dust was the most important matter to be considered.

Mr. ADAMS had considerable expectation that roller-bearings would come into use, and was now making arrangements to try some. In ordinary practice the great mistake was in using too little bearing surface. A larger journal was needed. The 4¼-in. standard was a move in the right direction, but it would have been better if it had been 5 ins.

One great objection which at present exists to the adoption of a standard box is the difference in the length of axles. In the construction of his box he had aimed to produce one that would go on axles of the old length and go on to the M. C. B. journal.

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Drawings and Photographs *of all new engineering works or designs, large or small, of interest from their magnitude, novelty, or originality, as well as newly adopted* **Standard Plans** *for engineering structures or details, rolling stock, etc., are always desired for early publication. Also* **Brief Technical Notes** *of the cost or manner of executing work, tests of materials, machines or other new devices, and* **News of New Construction** *of all kinds.* **Letters** *for publication must be accompanied by the name or card of the writer.*

Coming Technical Meetings.

Engineers' Club of Kansas City, Mo.—Next meeting, Dec. 2. "Snow Plows," F. E. Sickels. Annual meeting, Dec. 4. Secy., Kenneth Allen, 200 Baird Building.

Western Society of Engineers, Chicago, Ill.—Next meeting, Dec. 4. Secy., J. W. Weston, 78 La Salle St.

American Society of Civil Engineers. New York.—Next meeting, Dec. 4. Secy., John Bogart, 127 E. 23d St.

Engineers' Club of St. Louis, Mo.—Annual meeting, Dec. 4. Secy., W. H. Bryan, 809 So. 7th St.

Association of Civil Engineers. Dallas, Tex.—Next regular meeting, Dec. 6. Secy., E. K. Smoot, Elm and Austin Sts.

Engineers' Club of Philadelphia, Pa.—Next meeting, Dec. 7. Secy., Howard Murphy, 1122 Girard St.

Civil Engineers' Club, Cleveland, O.—Next meeting, Dec. 9. Secy., C. O. Parmer, 21 Cedar Ave.

New England Railway Club, Boston, Mass.—Next meeting, Dec. 11. Rooms in the United States Hotel.

Civil Engineering Society (Inst. of Technology), Boston, Mass.—Next meeting, Dec. 12. Secy., Clement March.

Western Railway Club, Chicago, Ill.—Next meeting, Dec. 17. Rooms in the Phœnix Building.

Engineers' Society of Western Pennsylvania.—Next meeting, Dec. 17. Secy., S. M. Wickersham, Pittsburg, Pa.

Boston Society of Civil Engineers.—Next meeting, Dec. 18. Secy., S. E. Tinkham, City Hall.

New York Railway Club.—Next meeting, Dec. 19. Room at 143 Liberty St.

A CORRESPONDENT who makes an inquiry as to center of population in the United States, and all others who are interested in a very curious bit of geographical statistics, will do well to turn to page xxxi of the "Population" volume of the 1880 Census, and especially to a map facing the second following page, where they will find full information on the position of this center since 1790. Its march westward since then has been almost miraculously uniform, both in its equal advance during each decade, and in its close adherence to the thirty-ninth parallel. Its exact position in each decade has been as follows:

	1790	1800	1810	1820	1830
N. latitude	39° and 16.5'	16.1'	11.5'	5.7'	—2.1'
W. long.	76° 11'	76° 56'	77° 37'	78° 33'	79° 17'
W. advance, m.		45'	41'	56'	44'
	1840	**1850**	**1860**	**1870**	**1880**
N. lat.	39° 2.0'	—1.0'	0.4'	12.0'	4.1'
W. long.	80° 18'	81° 19'	82° 49'	83° 36'	84° 40'
W. advance, m.	61'	61'	90'	47'	64'

The sudden increase in rate of westward advance in 1840 was due to the introduction of railways, and the decided jump in 1860 to the settlement of California, which had an immense influence on the position of the "center of gravity" of the population, since every man who went there was so far west of the center that his "moment" was very great. For this center (the only one which, to our knowledge, has ever been computed) is not the mere numerical center, that is, the point where a north and south, and an east and west, line will leave equal numbers on each side, but the point at which the "moments" of the inhabitants balance each other, that is, the number × distance; or the true center of gravity, if we assign to each inhabitant a given uniform weight. From the above table, bearing in mind the very great increase in the westward movement of population since 1880, it is apparent that the 1890 center will be about longitude 86° W., latitude 39° N., which will bring it at the village of Mt. Healthy, Bartholomew Co., Ind., about 83 miles due west of Cincinnati (it was eight miles in 1880), about 43 miles due south, or nearly so, of Indianapolis, and about 212 miles northeast of St. Louis, which in 1910 will probably be very near to the center of population.

THE center of population regardless of distances, however, is very much further east and very much further north. This will become apparent by examining any map of the United States, from which it will be seen that most of the population north of the "center of gravity" is but little north of it, and so has on an average much less than half the "leverage" of the population to the south. An east and west line dividing the population in two would pass about through the center of Ohio instead of the extreme south. The same is still more true of a north and south line splitting the population in two. The comparatively small population on the Pacific coast has an enormous effect to throw the center westward, owing to its distance therefrom, and a line parallel with the coast through Erie, Pa., would in 1880 have almost exactly cut the population in two, and even now is not much further west, so that the center of population in this sense is somewhere northeast of Columbus, O., and but slightly nearer to Chicago than to New York.

THE last report of President T. F. OAKES, of the Northern Pacific Railway, gives some remarkable figures for the increase of population between 1883 and 1889 for the towns along the line, as follows. We prefix the census population for 1880 to afford a solid basis of comparison, and add below the increase per cent. per year shown on the "face of the returns."

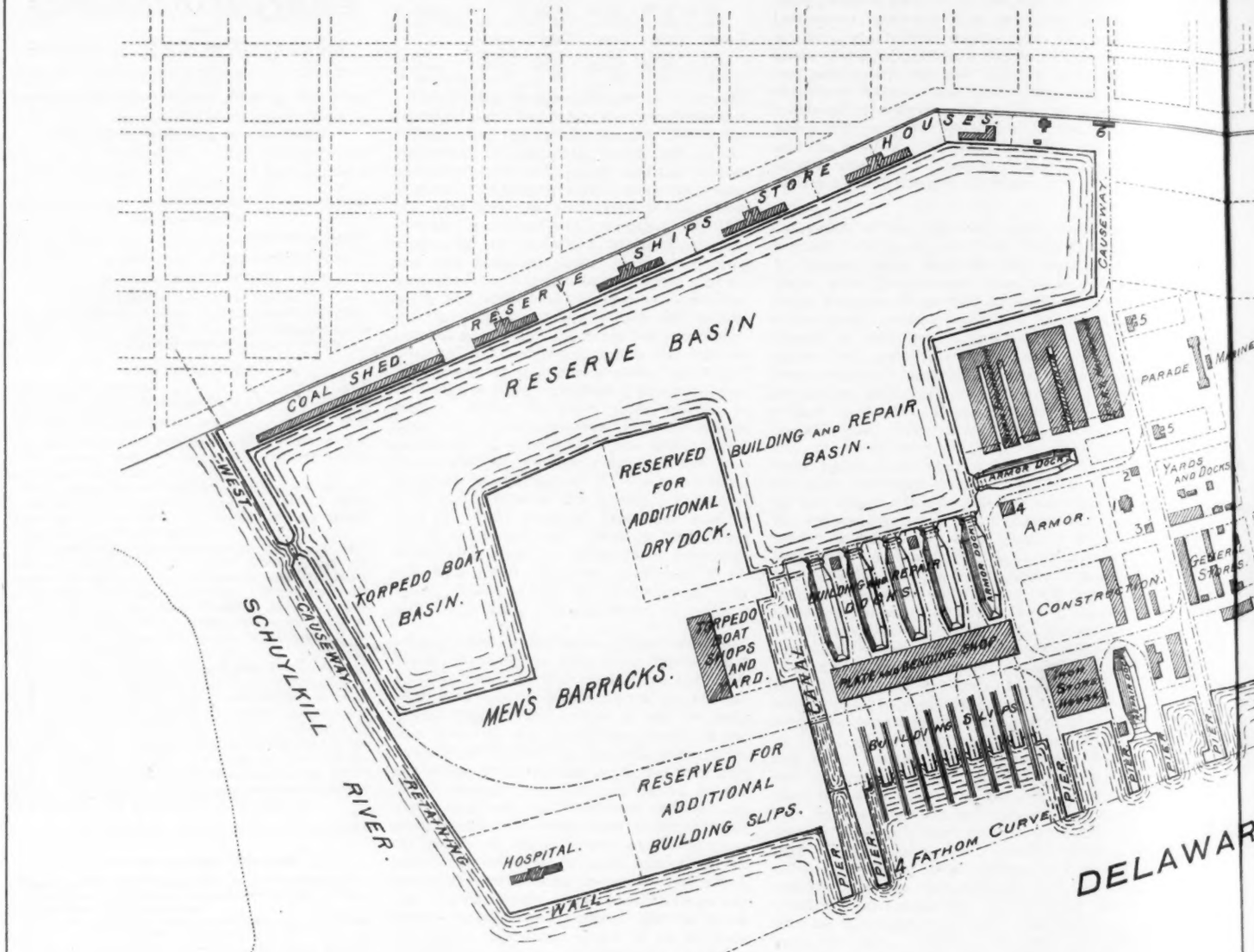
	Population in		
	1880	1883	1889
Ashland, Wis.	951	4,000	12,000
Superior, Wis.	655	2,000	15,000
Duluth, Minn.	3,483	6,000	35,000
St. Paul, Minn.	41,473	70,000	200,000
Minneapolis, Minn.	46,887	70,000	200,000
Helena, Mont.	3,624	6,000	20,000
Butte, Mont.	3,363	8,000	20,000
Anaconda, Mont.		1,000	4,000
Missoula, Mont.		1,000	4,000
Spokane Falls, Wash.	350	1,500	20,000
Yakima, Wash.		500	3,000
Ellensburg, Wash.		500	4,000
Tacoma, Wash.	1,098	2,500	25,000
Seattle, Wash.	3,533	5,000	25,000
Portland, Ore.	17,577	30,000	50,000
Totals	137,994	208,000	637,000
Increase		70,000	429,000
Increase p. c. per year		14.7	20.5

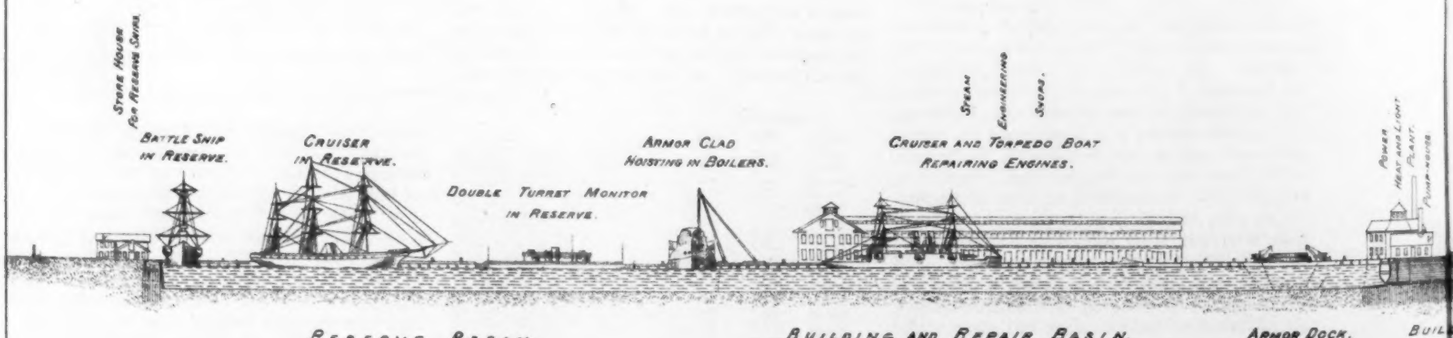
The last line of percentages decreases the apparent improbability of the rate of growth having been so great as shown, but yet, if the 1890 census shows any such growth as this, it will be a marvellous result. Our own estimates of the population of the same towns in 1888, published in our last "Manual of American Water Works," and made from entirely independent sources, aggregates 507,400, to which add one year's growth at 20½ per cent. and we have 624,700 instead of Mr OAKES' 637,000, which is a singularly close approximation for independent estimates.

APROPOS of the standard solid floors for railroad bridges on the New York Central & Hudson River Railroad now being illustrated in the ENGINEERING NEWS, the new Erie Canal Bridge at Rome with a floor of this sort, which was illustrated by us some months ago (March 22, 1889), got its first baptism by fire on the 12th inst. Five cars of a west-bound freight train left the rails and dragged across the bridge and scattered all over both the freight tracks, two of the cars having their trucks pulled from under them. The ties and roadbed were torn up so that the local paper states that it looked as if the company had been trying to run one train on two tracks. But no damage was done to the bridge because it was designed and intended to stand just such usage in case of need. We feel like insisting on the importance of this reform in bridge floors in season and out of season, since it not only greatly increases the safety of the bridge, in case of derailment, but cures at once and completely the otherwise all but insuperable difficulty of obtaining a smooth riding track in passing to and from wooden floors and ballast, and also prolongs greatly the safe life of the bridge by increasing the proportion of dead to live load,—a most important end, which has by no means had the attention from our engineers that it deserves. Whatever may be one's views on the pin-connected type in the abstract, no one can question that it has been used most improperly on many light spans which shake violently under every train which passes, and so are rapidly reducing themselves to an unsafe condition, although for the moment they may be safe enough, if the cars will only keep the rails. If iron and steel bridges were only built in this way, there would be no need for the otherwise commendable movement, which is acquiring strength on many first-class lines, of substituting masonry for iron work wherever possible. The same money put into a steel bridge will, in all cases, we believe, give as safe and even more durable a structure than masonry, although, all other things being equal, masonry is to be preferred.

THE Springfield arch question, frequently referred to in this journal, has been settled by the adoption of the plan of the original architects, Rutan & Coolidge, but with material alteration in the general design and especially in the parapet wall surmounting the arch. As illustrated in a recent issue of the *Springfield Republican*, the design shows beyond doubt that some of the seed sown in the past controversy has taken root. The original plan, given in our issue of July 28, 1888, called for a flat arch springing from the pavement line, with very ugly square buttresses at the ends, a very pronounced line of arch voussoirs, and the parapet wall carried directly upon the arch, without a break to its top other than those afforded by a line of small, unmeaning arched openings. It was this plan that was objected to as wasting space on the footways by the low springing

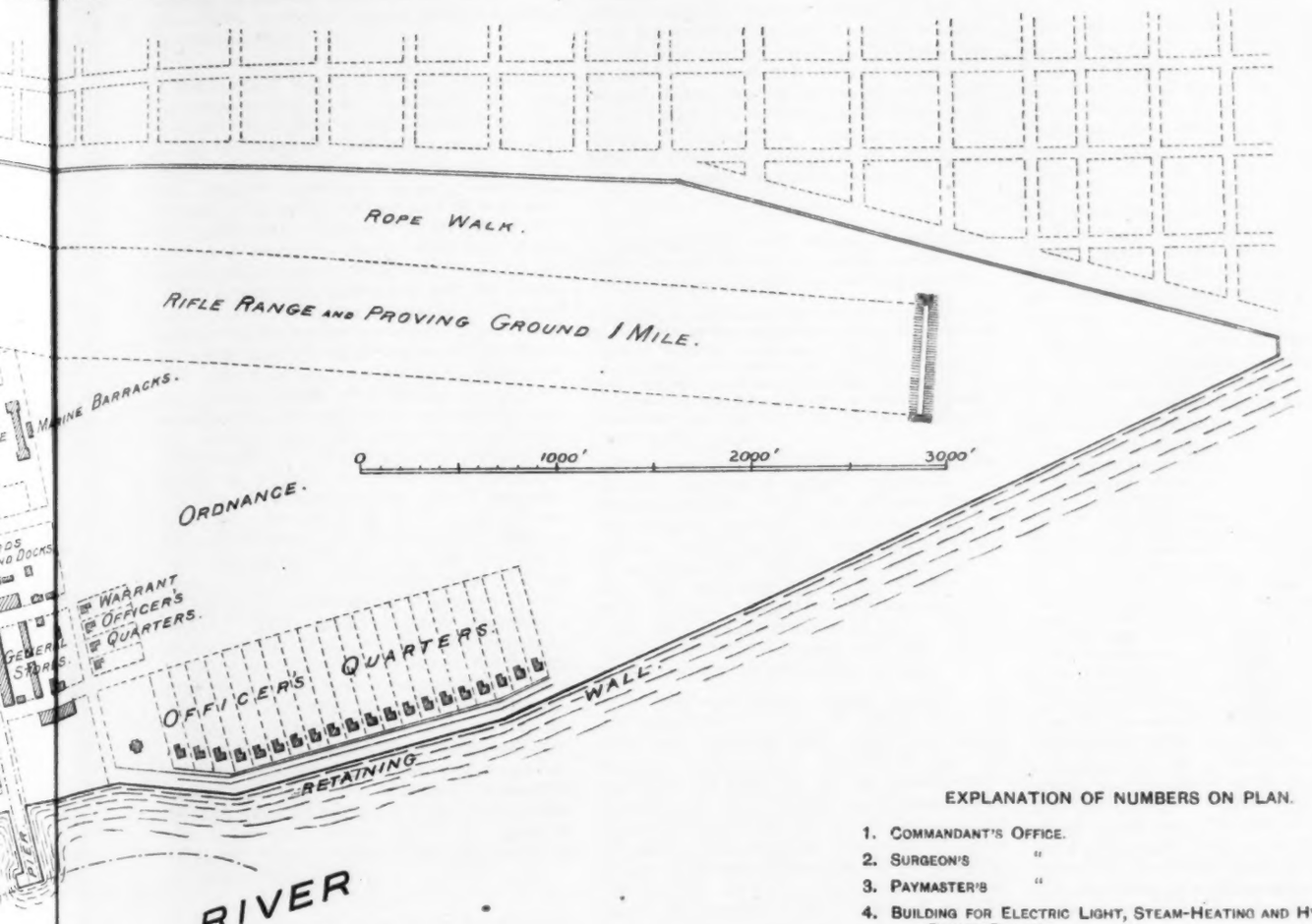
PLAN SHOWING PROPOSED AR




STORE HOUSE FOR RESERVE SHIPS.
BATTLE SHIP IN RESERVE.
CRUISER IN RESERVE.
DOUBLE TURRET MONITOR IN RESERVE.
ARMOR CLAD HOISTING IN BOILERS.
STEAM ENGINEERING SCHS.
CRUISER AND TORPEDO BOAT REPAIRING ENGINES.
POWER HEAT AND LIGHT PLANT. PUMP-HOUSE
RESERVE BASIN.
BUILDING AND REPAIR BASIN.
ARMOR DOCK.

CROSS SECTION OF COMPLETED YARD THRO

OSED ARRANGEMENT OF YARD.



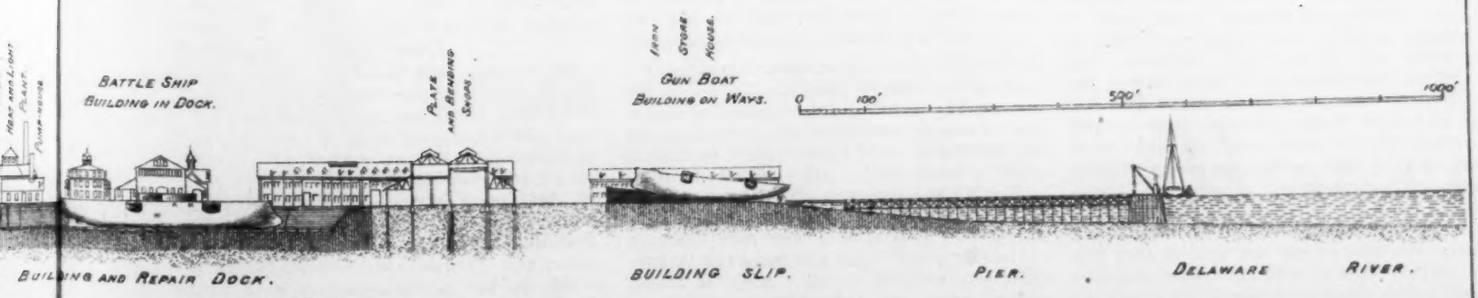
EXPLANATION OF NUMBERS ON PLAN.

1. COMMANDANT'S OFFICE.
2. SURGEON'S "
3. PAYMASTER'S "
4. BUILDING FOR ELECTRIC LIGHT, STEAM-HEATING AND HYDRAULIC POWER PLANTS.
5. MARINE OFFICER'S QUARTERS.
6. GUARD HOUSE.

THE UNITED STATES NAVY YARD
AT LEAGUE ISLAND, PENNSYLVANIA.

AS RECOMMENDED BY THE PERMANENT IMPROVEMENT BOARD, OCTOBER 10, 1889.

TOTAL AREA OF GOVERNMENT PROPERTY=923 ACRES.



THROUGH BASINS, DOCKS AND BUILDING SLIPS.

CHAS. HART & SONS. LITH. 36 VESEY ST. N.Y.

line, as appearing unnecessarily heavy over the crown, and as generally wofully lacking in artistic effect.

THE present design is a vast improvement in every respect; and considering that the county commissioners still insist upon the rather unnecessary 12 ft. stone parapet wall surmounting the arch, we must admit that the present treatment is very successful. The arch has been raised at the ends so that the whole width of the sidewalks can be utilized, and the arch voussoirs have been made much less prominent features in the structure, being apparently smooth-cut, and decorated, only with a plain top moulding. The ugly, square end-buttresses have been replaced by two handsome circular towers, rising above the main parapet, and richly but appropriately ornamented. And finally, the parapet surmounting the arch is now a very distinctive feature, running from tower to tower only, instead of being practically the continuation of a plain retaining wall extending without a break beyond the ends of the arch. This new parapet starts from a sharply defined base just above the arch, and is made to indicate plainly to the eye that it is *not* a part of the arch: the reverse effect was one of the most objectionable features in the old design. This parapet is now palpably a shield to hide the engines from horses passing beneath, and whether useful or not in this respect, it ceases to be a "stone lie": it has a reason for its being, and it tells its own story plainly. Altogether, we congratulate the present designers upon their wide departure from the plan that caused the trouble; and we also congratulate the citizens of Springfield upon the energy and good taste which caused the *Republican* of that city to step between them and what would have been anything but an ornament to their city.

THE patentees of some of the newest types of roller bearings for car journals are making strenuous efforts to bring their devices again to the attention of Master Car Builders; and a considerable number of cars equipped with these bearings are now in use on several roads in an experimental way. No doubt it is possible to design a roller bearing which will give as long a service as the best types of the plain bearing, but whether the gain in ordinary service will be, on the whole, sufficient to offset the increased expense seems quite doubtful. When any of the enterprising owners of these patents wishes to convince intelligent men of the value of his device in ordinary service, he will have tests made by disinterested experts of the friction of journals fitted with it when running at ordinary railway speeds. While we should be very glad to publish the results of such tests, we have little expectation that they would show any important reduction over the friction with ordinary brasses; for all previous tests of the kind (and there have been several) have shown that the advantage is only in starting, and disappears at high speed.

The point of real value with regard to these various types of roller bearing is that they do very materially reduce the power required to start the car. If their inventors would realize this, and would cease their attempts to bring their devices into use on ordinary cars, there would be much more hope that the roller bearing would prove a valuable invention. If a roller bearing can be devised, fairly durable, not too expensive, and reducing the friction of a car at starting and at slow speeds to about what it is with ordinary bearings at high speeds, there is no reason why it should not find a large market. For suburban trains, switching engine tenders, and all cars used for city transit—in fact, on every car required to make frequent stops in service—there seems no reason to doubt that the saving in power, and the gain in smoothness of motion and in time required to start, would make such a bearing a valuable acquisition. This, so far as is yet shown, is the limit of their useful application. Certainly this field ought to be first conquered.

THE rumors of many railway combinations have traveled across the ocean, and we find the following in *Engineering* of November 8:

Scarcely a week passes without the sensational announcement of the unification of some 40,000 or 50,000 miles of Western [American] railroads; but the announcements are forgotten as soon as read. The railroad managers are endeavoring to bring about such combinations, but have not yet succeeded, although it is growing to be a matter of life and death to them that they should.

From the last statement of the above paragraph, one would naturally conclude that the prospect for profits to railway owners was steadily growing worse, and that the present year would show as great a reduction in earnings over 1888 as that year showed over 1887. The actual facts are exactly contrary to this. Reports of railway earnings thus far this year show a probable average increase of 7 to 11 per cent. over the earnings of 1888, taking the country as a whole.

The negotiations for various combinations and consolidations are not being pushed to save the railways from immediate bankruptcy, by any means. The fact is that the men who are planning and working for various schemes of consolidation mean to make some handsome profits out of the proposed reorganization; and the prospects for great saving in operating expenses and reduction in the interest on bonds are good enough to justify their expectations. While it is quite true that these combinations may be made of great benefit to the public, as well as to the railways, no one claims that the men who are furthering the schemes are actuated solely or chiefly by philanthropic motives.

WE advise all purchasers of transits and levels hereafter to insist on purchasing instruments made only of aluminum if they can find such in the market. In fact, the reduction in the price of aluminum to $2 per lb. ought to be a greater immediate boon to field engineers than to almost any other class, the metal at $2 per lb. being so cheap that it can be liberally used in the construction of nearly all parts of all field instruments, with a saving in weight of at least one-half. It will probably be best to alloy the metal with copper or tin; but the experiments in this direction make it pretty certain that the proportion of the latter metals need not be so large as to greatly increase the specific gravity, and that the alloy will excel in beauty, ease, of working and non-corrosive qualities.

Aluminum transits have already been made, but their great cost has prevented the general use of the metal for this purpose. At present prices, however, the additional expense of an aluminum transit over a brass one should be quite moderate. For opera-glasses, field-glasses, hand-levels, compasses and the like, it is equally well suited, and it may well be expected that our enterprising instrument makers will adopt this metal for these instruments at once. To all makers who send us details of what they are doing in this matter, we cordially offer a free advertisement.

The League Island Navy Yard.

We print in this issue the report of the League Island Permanent Improvement Board, which has recently been made public by the Hon. Secretary of the Navy. This Board, of which Captain E. E. POTTER, U. S. N., was President, and Captains H. N. FARQUHAR and WM. WHITEHEAD, and Civil Engineers M. T. ENDICOTT and R. E. PEARY were members, was appointed about the first of last August, and has just finished its work. The Board's report has been warmly endorsed by Commodore WHITE, Chief of the Bureau of Yards and Docks, and there is every indication that it has been equally well received by the Hon. Secretary.

The comments of the Philadelphia papers, of which the following from the *Ledger* is a sample, show that the report has also gone straight to a tender and appreciative spot in the Philadelphia heart:

LEAGUE ISLAND RE-DISCOVERED.—It is not always that the Government gets as intelligent and valuable a Report on an important public matter as that which is now before the Navy Department (on its way to Congress) from the Board of Naval Officers appointed to examine League Island Navy Yard and report plans for its improvement. This approving observation is made not because the general scope of the Report is new to the Navy Department authorities, or to Congress, or the people, for it is not; but because the important subject of the complete and unique fitness and adaptation of League Island for the great Naval Station and Building Yard for iron and steel war ships which the Government needs, has never before been so thoroughly examined, or so effectively and comprehensively treated, as it is in this report just made. While it is a reinforcement of what has several times been brought officially to the attention of the Government, it is completely conclusive and should now be decisive.

This report, with the extensive improvements contemplated at the New York yard, and the expected addition to the plants at other yards, make it look as if at last our navy yards were really to be rehabilitated and brought up to a state of modern efficiency that will put them on a plane with the dockyards of the great foreign naval powers.

With a squadron of war-ships, built and armed in accordance with the demands of the day and after the practice of other great nations, now on its way to Europe, we have made a fair start in the new order of things. But to add to and maintain a modern fleet, the United States must also have yards fitted with all the requisite plant, and the Government can hardly spend a few millions more judiciously than upon these yards. The argument has been advanced that it would probably be better to build up a number of private yards by a distribution of public patronage, and thus to give an impetus to general shipbuilding in this country. But unless our shipping laws are radically amended at the same time, and our whole maritime policy changed, we do not see that the general trade would necessarily follow this method of building up our new navy.

No one doubts that we can build excellent ships, for war and peace, in any one of the several private yards now existing; or that, if there were a demand for the ships, other equally good yards would soon be started; and a standing offer from the best-known of our private yards to duplicate at equal price and with better material any one of the late English mail steamers shows what can be done when the time comes for our Government to encourage rather than to crush out private enterprise in this direction. But until we appreciate as a nation that it pays to sail under our own flag on all manner of business, and that it does not pay to pour out lavish tribute to other nations as common carriers of our goods, the Government gains rather than loses by owning its own yards for the construction of war-ships. This possible disposal

of public work serves as a check upon any outside combination of interests; and as the raw material must always come from private hands, the Government demand is quite as potent as that from individuals in tending to perfect and cheapen the manufacture of this material, and to pave the way for a wiser congressional or national policy. When the United States sees fit to pay subsidies to American rather than to foreign ship owners and builders, there will be plenty of work for private yards, and our Government will then probably be better served in its own yards; at least, it will lose nothing by using them as a counterbalance between public demands and private interests.

But a much stronger argument for a thoroughly equipped Government navy-yard, in this stage of our war-ship construction, lies in the fact that the Government can better afford than any individual, even with the heaviest contracts on hand, to put in the necessarily expensive plant required in a modern yard. This plant does not now exist anywhere, and to enable any one private yard to erect it by reason of a proportionate accumulation of national patronage, is to inaugurate a policy of favoritism that can only work evil; and to attempt to scatter this patronage about among all existing yards, or those that believe they have a reason for existence, must result either in inferior work or an unreasonably high price paid by the Government. The Government can erect a perfect plant to start with, and do it with the full knowledge that it can be put to work at any time. The individual, on the other hand, must first secure the contracts and then build a plant to fit these demands, if they exceed past requirements, as is now usually the case. This building of war-ships in Government yards is not a case of national competition with individuals; but it is rather the same policy that a shrewd individual would pursue in transacting his private business. His aim would be to secure the best results for the least expenditure of capital, and in this connection this policy seems quite as wise in a nation as in the individual.

Failures of Copper Steam Pipes.

Quite a discussion is going on in England over the frequent failures of copper steam pipes. The failure seems usually to take place at the seam, where the pipe is brazed together, and quite naturally, since the pipe at this point is thinner than elsewhere and is composed of brass instead of copper, a metal of much less tensile strength. The trouble is that the most careful workmanship is needed to insure a good joint; and as surely as the brazing is imperfectly done, trouble will ensue. *The Engineer* also propounds the hypothesis that a steam pipe is often subjected to much vibration and bending stress, which the brass at the joint will not endure, even when the brazing is thoroughly well done. In this way is explained the fact that pipes which have borne 300 lbs. pressure under test have afterward burst open when working under half that pressure.

Various remedies are proposed and tried for the trouble. In the Hamburg-American steamer *Columbia*, the builders have wound the steam pipes with wire. Steel hooping and the use of seamless drawn copper tubes have been suggested; but for large pipes the elbows must still be made of sheet metal.

The real remedy is very tentatively suggested by *The Engineer*, which says mildly, "It may yet be found practicable to produce steel tubes deserving confidence." To an observer on this side the water it would seem that very ordinary steel pipe, such as may be bought for a fraction of the price of copper pipe, is deserving of a great deal more confidence than a pipe with a longitudinal seam whose strength is dependent on the success of the delicate metallurgical operation of brazing.

It may indeed be that it is not possible to use steel steam pipes in marine practice; but our cousins over the water were once sure that nothing but a copper fire-box would do for a locomotive, until we, through our necessity, found out better. We are not inclined now, therefore, to take their assertion that it is necessary to make steam pipes of copper as settling the question.

Our contemporary, *The Engineer*, indeed says: "It is urged that steel tubes are liable to corrosion, and that scale is blown from them into the engines with bad results; also that they are not sufficiently flexible. Seeing that there are hundreds of miles of iron pipes in use on land, these objections are more imaginary than real; but perhaps the best pipe of all would be galvanized steel."

From the theoretical point of view, it would certainly seem that steel rather than copper is the proper metal for steam pipes. The boiler itself, which is subjected to the corrosion of the hot salt water, is made of steel; and since the steam pipe is subjected ordinarily only to the action of water condensed from the steam and practically free from saline matter, there seems little need of protecting the pipe from corrosion. In case the formation of scale proves an objection, it would seem an easy matter to prevent its reaching the cylinders by placing a separator next the engine.

We are not informed what practice American builders of marine engines are now following, but for our new naval vessels, at least, in whose success all are interested, it would certainly be best to refrain from following ancient practice in this matter, at least until careful tests have proved that mild steel is not a proper material for steam pipes.

NATURAL GAS IN CHICAGO is being earnestly advocated as the only escape from the coal smoke that darkens that city. Arrangements are now being made to pipe the gas from Indiana, and it is proposed to use the mains of two coal-gas companies to convey the new fuel. As to this last mentioned purpose, trouble may be expected, if the Pittsburg experience is any criterion in the handling of Indiana natural gas. The gas is to be brought from Kokomo, Ind., a distance of 128 miles, where the fuel company has leased 40,000 acres of land.

CORRESPONDENCE.

The Professional Man as an Advertiser.

TO THE EDITOR OF ENGINEERING NEWS:—

I have read with much interest Mr. OBERLIN SMITH'S suggestive article in your issue of Nov. 9 on "Engineering Society Papers as Advertisements," in which that gentlemen deprecates a tendency to use the engineering societies as hoardings or bill boards. According to his idea of the situation, all the societies err in laxity of rule as to such advertisement papers, but "last in the series and guiltiest of all, as an advertiser, is probably the electrical engineer." Mr. SMITH hopes that his friendly caution will impress upon the American Societies of Civil, Mechanical, Mining, and Electrical Engineers "a stronger sense of professional pride in a calling which should be truly scientific."

I trust you will permit me, as Chairman of the Committee on Papers and Meetings of the American Institute of Electrical Engineers, for the last two years, to make a brief reply to Mr. SMITH'S criticisms. If we are the worst offenders, we glory in our shame, but I cannot discover wherein we err. I have taken the trouble to go through our last two volumes of Transactions to determine the extent of our fault. I find that we have had, in the period covered, 35 papers. Of those, 25 have been of a strictly technical nature; while the other 10 have been open to the accusation of advertising the author's inventions. The first category includes papers by such men as Profs. ELIHU THOMSON, H. A. ROWLAND, E. L. NICHOLS, G. W. PLYMPTON, H. J. RYAN, F. B. CROCKER, and Dr. LOUIS DUNCAN—all of them but one connected with colleges and universities. In the second category appear two distinguished professors, one an Englishman, who described their own devices, and gave the society two extremely enjoyable and profitable meetings. In three other cases, the papers were mathematical in treatment, and the authors certainly deserved all the advertising they could derive from their formulæ. In yet two other cases, the papers were so valuable to the profession as a whole that I would rather have sacrificed a baker's dozen of the theoretical ones for them. They are, moreover, the papers that have been the most widely copied and commented upon in Europe as well as in this country.

Our "Papers Committee" of the Electrical Engineers has aimed squarely at two objects. In the first place, we have said to all the colleges and universities devoting special attention to electrical studies: "Give us your results. If you have reached any new truth, let us be the medium of its publication to the world. It may possibly hurt somebody, but science and practice will be the gainers." On the other hand, we have said to the electrical engineer or inventor: "The Institute is the technical body of your profession in this country. If you have discovered or invented or improved something, bring it before your professional brethren and peers, some of whom are rivals and competitors. We will give you a platform, an audience, and fair play. If you can mark an advance, there will be generous recognition of it. If you are a quack, your exposure will be swift and complete." The inventor may benefit himself, but if his ideas are worth anything he benefits the public more. Invention breeds inventions.

There may be something wrong with this catholic programme and these comprehensive principles, but we of the electrical engineers have yet to learn it. We esteem it a privilege to be instrumental in recording the views of Prof. ROWLAND on the "Nature of Electrical Currents," or those of Prof. ELIHU THOMSON on "Magnetism." But the Institute is not merely a high science physical society. It is a body of electrical engineers, and it has, therefore, been glad to hear Dr. LOUIS DUNCAN on the "Inherent Defects of Lead Storage Batteries," or Prof. F. B. CROCKER on the "Limitations of Chemical Generators of Electricity," both of which papers are about as far removed from advertising the subjects they treat of as they possibly can be. Yet we are not averse to hearing from Prof. GEORGE FORBES, of London, on his own beautiful meter, or from Mr. NIKOLA TESLA on the magnificent advances he has made in the new field of alternating currents; or from Mr. JOHN HOWELL on the efficiency of Edison incandescent lamps, bringing to the Institute in mathematical shape the results of several years' investigation that cost the company, of which he is electrician, many thousand dollars.

I believe that the foundation of the work of the electrical engineers is broad, and that it is not the less deep. We should not think more meanly of ourselves if MORSE had brought before us his electro-magnetic telegraph, but we are always ready for the addresses of a HENRY or a ROWLAND. One of our coming and most important papers this season originates at Cornell, and nearly succeeding it will be one dealing with the most promising of the new applications in electricity, which, we think, will not be altogether right till it has our seal of approval on it.

At the risk of narrowing down the discussion to merely personal questions, I would add that on our Committee with myself is another technical journalist. I think we may be trusted to see to it that the Engineering Societies do not usurp any of the functions rightly belonging to the technical journals.

T. COMMERFORD MARTIN.

NEW YORK CITY, Nov. 16.

[Mr. MARTIN certainly makes a strong defence. As the impeachment is not ours, we will not attempt to answer it. The questions involved are delicate and important ones, and there is something to be said on each side. It is of interest in this connection to note that the Institution of Electrical Engineers of England has brought criticism upon itself in reference to this same matter. We find the following paragraph in an editorial in *Industries* of Nov. 8.—ED. ENG. NEWS.]

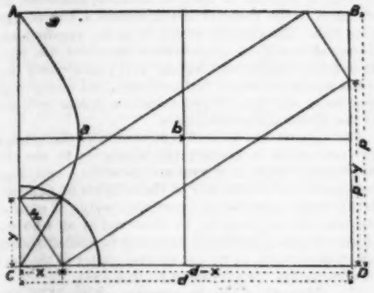
Now that the Institution [of Electrical Engineers] is on new ground, it is time that it put its foot down on advertising. If any one designs an instrument, or a switch, or some other piece of apparatus, he should not be allowed to read a paper on it unless it involves some new principle. Above all things the Institution ought to act up to its new name. It should be an institution of engineers—a society of practical engineering, not of abstract science a professional, rather than a professorial society. It should not poach on the preserves of the Physical Society, to which questions of pure electricity properly belong; but on the other hand it should not devote time to descriptions of work that could well be left to electrical journals.

Length of the Howe Strut.

TO THE EDITOR OF ENGINEERING NEWS:—

It would seem that Mr. D'ARMIT's solution of this famous problem in the issue for Nov. 16 is unnecessarily complex. For a "clean-cut and concise" solution what is the matter with this?

Let w = width, d = longer side or depth, p = smaller side or panel length.



Length of Howe Truss Strut.

Then $x^2 + y^2 = w^2$

This is a circle. Draw it at corner.

$$\text{Also } \frac{x}{y} = \frac{p-y}{d-x} \text{ or } x(d-x) = y(p-y)$$

This is an equilateral hyperbola through A and C, B and D, the distance $a\,b$ being $\frac{1}{2}\sqrt{d^2-p^2}$. If the rectangle $A\,B\,C\,D$ be a square, $a\,b = 0$.

Draw as much of the hyperbola as is needed.

The intersection gives the co-ordinates x and y of the side w in true position.

This construction can of course be made at each corner. I have omitted the other branch of the hyperbola and the other circles.

To a good scale the values of x and y can be determined with great accuracy. Length $= \sqrt{(d-x)^2 + (p-y)^2}$.

Conchoids, ellipses, parabolas, etc., are not necessary.

* * *

[This is certainly more "clean-cut and concise" than Mr. D'ARMIT's or any other known to us, and although it is graphical as given, it would be but a short step further to determine the intersection of the circle and hyperbola analytically, and so make the solution purely analytical.—ED. ENG. NEWS.]

The Palatine Bridge Disaster.

ALBANY, N. Y. Nov. 19, 1889.

TO THE EDITOR OF ENGINEERING NEWS:

I inclose a recent decision of the Board of Railroad Commissioners on accident at Spraker's (near Palatine Bridge) on Sept. 27, which contains some features that may amuse if not instruct. For instance, there is a question as to the time the first section of the train passed Yost's, the station agent claiming he posted the figures 11.26 while the firemen claims they were 11.31. One would have made the two sections 9 minutes apart and the other 4 minutes. The Board somehow concludes it was "not less than five minutes." Again the Board says that if two trains are 5 minutes apart and the first one consumes 1¼ minutes in stopping, they will be "less than 3¾ minutes" apart. As the average rate of the first train during the time it is slowing up will be half of its original rate, I figure that only ¾ minute will be lost by such a stop, and the trains will be 4¼ minutes apart. I apprehend too that if for any reason the first train should stop "instantly"—a proceeding which the Board very properly infers cannot always be relied upon—it would probably be somewhat detrimental to the equanimity of the passengers. Other points in the report will also strike you, probably, as "funny."

[The following is the full text of the important parts of the report.—ED. ENG. NEWS.]

At a point about ¾ of a mile west of Spraker's Station, the first section stopped on account of a burst in the steam chest on engine 714. The second section crashed into the end of the private car of the Michigan Central road. The rear of this car, for about 10 ft., was fitted up as an observation room, and was crushed through for about 8 ft. The remainder of the car, owing to its unusual strength, was comparatively uninjured. The car ahead was injured comparatively little. It appears that, the rear end of this car was pressed down, tilting up the forward end, which telescoped the Wagner sleeping car ahead of it.

The private car was some 8 or 10 ins. narrower than the sleeper ahead. Had its frame been the same width as that of the sleeper, it is probable that little or no injury would have been done. As it was, however, the resistance that it met was only from the interior construction of the sleeper.

The dead and wounded were all found in the latter car, except the porter of the private car, who was killed when the telescoping took place.

Rule No. 87 of the New York Central road, with regard to the movement of trains, provides "Passenger trains running in the same direction must keep not less than five minutes apart, unless some form of block signal is used."

It is the practice of the company to post at each station figures, indicating the time of the passage of the last train. These figures are illuminated at night, so as to be plainly seen.

It appears from the evidence of WILLIAM WEEKS, the engineer of section No. 1, that when he reached a point near Yost's station he noticed the escape of steam from the steam chest of the locomotive. He could not account for it, but thought it probably came from a defect in the packing of the valve stem. He says that he did not stop immediately, being only about six miles from Palatine Bridge, where he could have stopped with perfect safety, and he thought that he could run to that point.

He also draws attention to the fact that he was on a curved track when he first noticed the escape of steam, and deemed that it was his duty to reach, if possible, a straight track before stopping his train. Rule No. 117 of the general instructions of the railroad provides that "trains having occasion to stop on the road from any cause, must stop where the view is long and clear."

He also claims that immediately before stopping he whistled for the brakeman to go to the rear to protect his train.

Criticism has been made of Engineer WEEKS' conduct to the effect that he displayed bad judgment in not stopping immediately upon the discovery that there was something wrong with the engine. The Board is hardly prepared to agree to this view of the case. As WEEKS stated, in which the experience of most engineers sustains him, there is very likely to occur, from time to time, some little escape of steam, such as he noticed, which would not justify the stopping of a train such as this, particularly when within a few miles of a regular stopping place.

The bursting of a steam chest is a most unusual occurrence, and one which he could not have anticipated. It is also to be taken into consideration that WEEKS is a locomotive engineer of many years' standing, fifty odd years of age, and that he has always borne a good reputation upon the road as a careful and competent man. While it turns out that it would have been better for him to have stopped immediately upon this occasion, his mistake in judgment, if a mistake at all, was of the kind that hardly justifies censure.

The conduct of ALLEN PATTEN, the rear brakeman, is one with regard to which considerable conflict of evidence exists. He testified before the Board that before the train stopped, while still running at the rate of five to six miles an hour, he got off and went to the rear. The point which he claimed to have reached was indicated by him to the authorities of the road, the distance measured and found to be 1,180 ft.

Engineer WM. HORTH of the second section, however, testifies that he saw the rear lights of section No. 1 at the same time that he saw those of PATTEN; that it did not appear to him that he was more than 500 or at the most 600 ft. from the rear section No. 1 when he saw PATTEN.

It is perhaps also proper to say that the porter of the rear car of the first section states, though not under oath, to the authorities of the railroad, that PATTEN did not go back immediately upon the stoppage of the train but after having left the train went toward the forward part and then back. The probabilities that PATTEN did not go as far as he states that he did, and possibly thinks that he did, are evidenced by the fact that the second section did not more reduce its speed, if not entirely stop before colliding. Had PATTEN reached 1180 ft. from the first section, it would seem that the second section should have reduced its speed to a rate not to have done such serious damage. Either PATTEN was not back to the point that he says he was, or the brakes of the second section did not operate properly. There is nothing to show that the latter was the fact.

Engineer HORTH, immediately upon seeing PATTEN, reversed his engine, and, as he states to the Board, stood on the step while he pulled the lever of the sand-box to be sure that the wheels should catch, and there remained until the collision occurred. He was severely injured, both legs being broken.

There is nothing in the evidence to show positively that any blame rests upon HORTH, unless it be that after passing Yost's station he encroached upon the five minutes interval which he should have allowed between his train and the preceding one.

There is considerable conflict of testimony upon this point. The station agent at Yost's, JOSHUA SUITS, testifies that the first section passed at 11.26, and that he so posted it; that the second section passed at 11.35. This would have made nine minutes interval and would have justified HORTH in maintaining his schedule speed. HORTH's fireman, however, JOHN SLATER, testified that the figures posted at Yost's were 11.31. This would have given but four minutes interval. If such was the fact, HORTH should have diminished his speed after passing Yost's. The conflict on this subject, however, is such that *the Board is disposed to believe that* HORTH *was at least five minutes behind the time of the first section.* His conduct in remaining at his post and sprinkling the sand on the track in the face of great danger was highly commendable.

CONCLUSIONS.

After a careful consideration of all the circumstances attending this accident, the Board is of the opinion that the principal cause thereof was the rule of the New York Central & Hudson River Railroad Company permitting these sections to be run at as close an interval as five minutes. It is to be considered, however, that the company only adopted this rule after its adoption by the Time Convention. This body consists of the general superintendents or genera managers of a large number of the railroads of the United States. A special committee made up of the representatives of the prominent roads of the country, formulated the rule after long consideration.

In view of this accident, however, the Board is of the opinion that the interval of time is too short. *If for any cause the train in advance cannot stop instantly, but consumes say 1¼ minutes, and in coming to a stop it leaves less than 3¾ minutes for a brakeman to get back to signal the following train.* On a slippery or stormy night, with his lamps, it is quite possible that he cannot make more than 1,200 ft. in this time. This is too short an interval of space for a train at high speed, under all the circumstances, to be from the preceding train.

That a local train can with safety leave a station 5 minutes after the departure of an express train, is undoubtedly true, but the Board is clearly of the opinion that an interval of not less than 10 minutes should be required between passenger trains of the same class in the same direction, or sections of the same train following each other, unless a block system be used.

The Board has been investigating the matter of block systems, but has not yet sufficient data to express a positive opinion upon the subject.

Such a system upon the Hudson River road exists between the Grand Central Depot and Spuyten Duyvil. The Board is of the opinion that it might be extended, with benefit, as far as Croton, between which point and New York the trains are very numerous. Whether it be necessary to extend it the whole length of the road, the Board at present is not prepared to express an opinion. There is no doubt that very considerable delay in the movement of trains would ensue, unless the block stations were close together, in which case the expense of management would be very great. It is also to be considered that if such a system be essential for safety on the tracks of the New York Central road, where there are two freight and two passenger tracks, it would be still more so on every other railroad in the state. The Board would not feel justified in taking such a radical step as this, until satisfied that such system was essential for the safety of travel.

The Board deems that if the ten minute rule be adopted, with the present system of blocking the road by time indicators at the stations as hereinbefore described, there would be little or no danger from rear collisions, *if the rules of the company are strictly enforced.*

RECOMMENDATIONS.

"*First.*—That the New York Central & Hudson River Railroad Company amend Rule No. 87, so that it will read "Passenger trains running in the same direction must keep not less than *ten minutes* apart unless some form of block signal is used.

"*Second.*—That the railroad company take into consideration the subject of equipping the entire line with block signals, and particularly that portion between Spuyten Duyvil and Croton, and submit to the Board of Railroad Commissioners an estimate of the cost thereof, and of the practicability of the same so as not to interfere with the punctuality of service, particulary of local trains.

"*Third.*—That all six-wheel trucks be equipped with a brake on every wheel instead of, as at present, brakes only on the outside wheels."

Rock Fill Dams.

W. R. JUNCTION, VT., NOV. 4, 1889.

TO THE EDITOR OF ENGINEERING NEWS:

Can you refer me to any source from which I can obtain details for the construction of a rock fill dam 50 ft high, providing for an ultimate height of 100 ft.?

It will also be necessary to provide for a large flow of waste water in flood time, either through a spillway or over the top of the dam, or both.

Are there any rock fill dams at the height of the above now in existence? Very truly,

H. N. SAVAGE

[The columns of ENGINEERING NEWS are the best and only source of information on this subject which as yet exists, except that some abstracts from the matter which has appeared in our columns will be found in Prof. BAKER's "Treatise on Masonry Construction." We may fairly say that the type as a type, and also the name therefor, was invented by this journal, although it subsequently appeared that several dams of the kind had been constructed in California, and we have published descriptions of them. With a good rock or hard pan bottom, the construction is perfectly simple, being merely to dump in the rock; and the height to which the dam is carried makes no difference, except that if the water is to be spilled over the top, additional pains must be taken during construction to compel the water to form in advance the lowest possible slope to which it is capable of bringing the rock. With any other bottom, more engineering skill and judgment is required in fitting the design to the circumstances of the case, but there are no real difficulties. In any dam it is always better to have a separate spillway if it can be made ample for all contingencies.—ED ENG. NEWS.]

Notes and Queries.

L. H. G., of Palmer, Mass., asks for information concerning the use of blast-furnace slag as a substitute for crushed stone in making concrete. In answer we would say that it has been so used, and satisfactorily, we believe, with some saving in the cement ingredient. The objection to its use is the very uncertain and ever-varying composition of the slag, which defies any rule for making reliable concrete. We would be pleased to hear directly from any of our readers having actual experience in the use of slag.

L. F. B. asks: Will you tell me in your next issue where I can find the position of the centers of population and the geographical centers for the different censuses of this country from the first? Also the probable position of the center of population for 1890, excluding Alaska in every case. [See editorial page.] Is there a Statistical Atlas for any other census than that of 1880? [No.]

I would like to know where I can find statistics of emigration to this country and the number from the separate foreign nations. [In "Statistical Abstract of the United States," Bureau of Statistics, Washington, D. C.]

PERSONAL.

Mr. CHARLES M. RICKARD has been appointed City Engineer of Springfield, Ill.

Mr. W. W. SALMON has been appointed Division Engineer of the Philadelphia & Atlantic City Railway.

Mr. B. G. CARPENTER, formerly President of the Wilkesbarre Water Co., died recently.

Mr. M. GILHOOLEY, Roadmaster of the Chattanooga, Rome & Columbus, has resigned.

Mr. W. H. WIGHTMAN, C. E., died at Ashland, Oregon, on the 29th inst.

Mr. S. C. BROOKS, one of the oldest master mechanics of the Lake Shore Railway, died at Cleveland recently.

Mr. CHARLES H. ROCKWELL, has been appointed General Superintendent of the Columbus, Hocking Valley & Toledo R. R.

Mr. B. J. MARSTELLAR, Superintendent of Construction in the Engineer's Department, Kansas City, Mo., has resigned, and Mr. KENNETH ALLEN has been appointed to succeed him.

Mr. H. M. LANE, Chief Engineer of the Providence Cable Tramway Co., Providence, R. I., has resigned. Mr. C. A. MIXER, Constructing Engineer, has also resigned.

Mr. DENNISTON WARD has been appointed Treasurer of the Cincinnati, Jackson & Mackinaw roads, vice Mr. F. FISHER, resigned. Mr. WARD will have his headquarters in New York City for the present.

Mr. C. M. WARD has been appointed General Manager of the South Carolina road. Mr. WARD for some years has been a Division Superintendent on the Baltimore & Ohio road.

Mr. GEORGE H. BROWN, late Assistant Supervisor of the Middle Division of the Pennsylvania Railroad, has been transferred to be Assistant Supervisor of the Pittsburg Division.

Mr. RUDOLPH HERING, C. E., has been made the chairman of a commission of engineers to investigate and report upon the best method for disposing of the sewage of Los Angeles, Cal. The report is to be made by Dec. 16 to the City Council.

Mr. GEORGE M. FARLEY has been appointed Superintendent of the Western Division of the New York & New England R. R., vice Mr. CHAS. H. PLATT, who has resigned to accept the position of General Manager of the Grand Central Depot in New York, in charge of the tracks of the New York Central, Harlem River and New York, New Haven & Hartford roads from New York City to Mott Haven, N. Y. Mr. PLATT succeeds Mr. C. D. MCKELVEY, resigned.

Judge RICKS has appointed JOHN CRUTHERS, of Toledo, receiver of the New York, Mahoning & Western Railroad Company, a short line running from Ottawa to Findlay, which was completed not long since. The American Midland Railroad Company, which built the road for the N. Y., M. & W. Company, recently began an action in the United States Court at Toledo, on a claim of about $30,000 alleged to be due for construction, securing the right of way, etc., asking that a receiver take charge of the line pending its sale.

Superintendent THOMPSON, of the Burlington & Missouri, announces the following changes on the Northern Division: Mr. E. BIGNELL, Assistant Superintendent, will be relieved of the lines north of Aurora and Aurora to Ravenna and his jurisdiction extended over the lines from Alliance to Newcastle, with headquarters at Alliance. Mr. V. O. ENGLISH is appointed Assistant Superintendent with headquarters at Aurora, and jurisdiction over the lines from Kearny to Aurora (excluding Hastings yards), Aurora to Arcadia, Palmer to Burwell, and Greely Center to Ericson.

Mr. R. T. SCOWDEN, C. E., now City Engineer for Louisville, Ky., is unanimously nominated for reflection in that city, and the *Courier Journal*, of Louisville, gives a lengthy sketch of his professional career, of which the following is an abstract. Mr. SCOWDEN is the son of the former chief engineer of Cleveland, O.; he came to Louisville in 1857 as assistant engineer in charge of the new water-works and completed them in 1859. In 1873 he was made chief engineer of the Cincinnati works, but was removed in 1874 through the machinations of a ring of thieves he had exposed, connected with the new waterworks. He was afterwards associated with Mr. T. W. RUTHERFORD in building water and gas works, including among these the Atlanta water-works. He has been City Engineer of Louisville since 1876, and his work in that city is especially commended by the journal quoted.

The Redemann-Tilford Steel Process.

The Redemann-Tilford Steel Process, that is now being tested by the Navy Department at Washington, claims to be revolutionary in its character, though as yet little seems to be commonly known of its real qualities. As near as can be now ascertained, the process includes a bath of glycerine and hydrocarbonated substances in solution in water; the metal, heated to white heat, is plunged into this bath and allowed to cool. The effect, as explained, is that the heated metal liberates hydrocarbon gases, which are taken up by the metal and bring about both chemical and physical changes in the material.

The change is claimed to be permanent, and to transform low-grade steel, worth a few cents per pound, into steel of the highest grade, such as is now being used for the finest tools. This steel may be reheated, welded, hammered, etc., without injury. The new steel is said to have 50 to 100 per cent. greater tensile strength and much greater elasticity than the best grades of ordinary steel. These claims are based on reported tests made at the Pittsburg Testing Laboratory, Carnegie, Phipps & Co., and by the United States authorities at Louisville.

It is said that an old steel rail, after being treated by this process, was transformed into excellent razors and other tools requiring the finest of steel. The most interesting feature claimed for the invention is that a mass of metal may be so treated as to be made exceedingly hard throughout, or it can be given a hard surface and a soft center or core, with the hardness gradually diminishing from the surface to the core. This quality would of course make it immensely useful in drill-proof construction, armor-plate, projectiles, guns, etc. The statement is made that a piece of this steel, 12 x 6 ins. and 6 ins. thick, hardened on this sliding scale, was subjected to a drilling test at the Ordnance Department in Washington. Beginning on the soft back, the first inch was drilled in 1 min. 10 secs., the second inch in 16 min. 23 secs., and the next ½ in. in 21 min. 15 secs., when the drill broke with 3½ ins. yet to be drilled. So far, there is only an experimental plant for making this metal, at the Meikle Plow Works, Louisville, Ky. The result of numerous analyses of this metal by Prof. L. B. KOSTENBINE show that the common Bessemer steel, principally used in the process, has under the treatment gained about 40 per cent. of carbon and lost sulphur and phosphorus; while the grain becomes homogeneous, compact, and silky in fibre. The inventors are HENRY M. REDEMANN and ROBERT J. TILFORD, both of Louisville, Ky.

The Institution of Civil Engineers.

The Secretary has issued the following circular relating to papers, students, etc.

For many years it has been the aim of the Institution of Civil Engineers to make itself the center of information on all branches of engineering from every part of the world. That aim is exemplified and supported by its "Minutes of Proceedings," and also by the additions constantly being made to its library. When the Institution was founded, its originators held to the principle that all who joined it should enter into an obligation to contribute in some form to the common stock of knowledge. This was obviously an essential condition in the early days of the Society, and, although now to some extent disregarded, it must be apparent that the usefulness of the Institution can only be maintained by a like spirit actuating the existing members.

Engineering is an eminently progressive science or art. There is no prospect of any relaxation in its activity nor of finality in its development. It may, therefore, safely be assumed that original communications, or "papers" as they are now termed, will continue to be presented, so as profitably to occupy attention at the meetings by leading to discussions of interest and importance. The list of subjects for papers enclosed herewith will serve to indicate some of the many topics that may, it is believed, usefully be dealt with.

According to the By-Laws, each session of the Institution is to commence on the second Tuesday in November, and the meetings are to be held weekly (with certain exceptions) until the end of May. At the first meeting on Tuesday, Nov. 12, Sir JOHN COODE, K. C. M. G., will deliver his Inaugural Address as President, and the premiums gained for papers submitted in the past session will be handed to such of the recipients as are able to attend. At subsequent meetings there will be brought forward papers on "Water-Tube Steam-Boilers for Marine Engines," by Mr. JOHN I. THORNYCROFT; "Triple-Expansion Engines at the Owens College, Manchester," by Prof. OSBORNE REYNOLDS; "The Shanghai Water-Works," by Mr. J. W. HART; "The Tytam Water-Works, Hong Kong," by Mr. JAS. ORANGE; "The Erection of the Dufferin Bridge over the Ganges at Benares," by Mr. F. T. G. WALTON; "The New Blackfriars Bridge on the L. C. & D. Railway," by Mr. G. E. W. CRUTTWELL; "The Hawkesbury Bridge, N. S. W.," by Mr. C. O. BURGE; and "An Account of the Liverpool Docks," by Mr. GEORGE FOSBERY LYSTER.

Respecting persons seeking to belong to the Institution, or desirous of being transferred from the class of Associate Member to that of Member, attention may be directed to the Instructions on Forms A and B, enclosed herewith. The Council wishes it to be emphatically understood that in all cases minute inquiries will be made as to the professional training and position and the personal qualifications of the candidate, and members should decline to sign any recommendation unless well satisfied of the fitness of the candidate.

The Council has deemed it advisable in the interests of the profession to restrict the admission to the class of Students to those only who can produce a certificate, or certificates, of proficiency in the subjects of general education from some public examining body. A copy of the Regulations in future to be observed by all who wish to enjoy the many privileges accorded to Students accompanies this circular, as well as several copies of the Form A2 of nomination for admission to this class.

The Council of the Institution of Civil Engineers has also issued the following regulations as to the preliminary education of candidates seeking admission as Students, requiring a higher grade of preliminary education than has heretofore been established for Students:

1. On and after June 1, 1889, no person shall be admitted as a Student unless he shall produce evidence of a competent knowledge of the subjects of general education specified in the following list:—

(1) English Grammar and Composition.
(2) Elements of Mathematics, comprising (*a*) Arithmetic, including Vulgar and Decimal Fractions, (*b*) Algebra, including Quadratic Equations, with one unknown quantity, (*c*) Geometry, including the first three books of Euclid, with easy questions on the subject matter of the same.
(3) Elementary Mechanics of Solids and Fluids, comprising the Elements of Statics, Dynamics, and Hydrostatics.
(4) Two of the following optional subjects:—
(*a*) Latin (*b*) Greek, (*c*) French, German, Italian, or any other Modern Language, (*d*) Logic, (*e*) Chemistry, Geology, Botany, or any other branch of Physical Science.

2. The evidence required in the above regulation shall be furnished by certificates to show either—

(A) That the candidate has obtained any one of the educational distinctions named in Schedule No. I; or
(B) That the candidate has attended classes in any of the public educational establishments mentioned in Schedule No. II., or any of the qualifying subjects, and has acquired a competent knowledge of the same; or
(C) That the candidate has passed one or more examinations in any of the qualifying subjects, by any of the recognized public examining bodies mentioned in Schedule No. III.

The certificates mentioned in (B) and (C) must, in the aggregate, include all the qualifying subjects named in Regulation No. I.

3. The Council may from time to time extend, alter, or otherwise amend the Schedules Nos. I., II., and III.

The Council reserve to themselves power to accept special qualifications of practical work in lieu of certain educational qualifications; or to waive any of the above-named requirements under special circumstances as they may think advisable.

SCHEDULE NO. I.—*Educational Distinctions which of themselves imply sufficient qualification.*

Any degree in Arts, or Science, or Engineering, in any University in the British Empire.
Matriculation in the University of London.
Matriculation in the Engineering Department of University College, London.
Matriculation in the Central Institution of the City and Guilds of London Technical Institute.
Election as a "Whitworth Scholar."

SCHEDULE NO. II.—*Public Educational Establishments which include Special Preparation for the Engineering Profession.*

University College, London.	University of Edinburgh.
King's College, London.	Glasgow and West of Scotland Technical College.
Royal Indian Engineering College, Cooper's Hill, Staines.	Dundee University College.
City and Guilds of London Technical Institute (Central Institution or Finsbury College).	Dublin University (Trinity College).
The Normal School of Science and Royal School of Mines, South Kensington.	Royal University of Ireland.
Royal Naval College, Greenwich.	Royal College of Science for Ireland.
Durham College of Science, Newcastle-on-Tyne.	Queen's College, Belfast.
Owens College, Manchester.	Queen's College, Cork.
University College, Liverpool.	Queen's College, Galway.
Mason Science College, Birmingham.	Civil Engineering College, Poona, Bombay.
University College, Bristol.	Civil Engineering College, Calcutta.
Yorkshire College, Leeds.	Civil Engineering College, Madras.
University College, Nottingham.	Civil Engineering College, Roorkee, N. W. Provinces, India.
Firth College, Sheffield.	University of Toronto.
Hartley Institution, Southampton.	McGill College, Montreal.
University of Glasgow.	King's College, Windsor, Nova Scotia.
	University of Sydney.
	University of Melbourne.
	University of Adelaide.

The schedule is interesting as a substantially complete list of the engineering schools of the British Empire.

Elements of Weather in the United States of most Interest to Engineers, for the month of October, 1889.

STATIONS.	Temperature. Degrees Fah.				Wind velocity. Miles per hour.			Precipitation. Rain and melted snow. Inches.		
	Average	Max.	Min.	Range.	Average.	Max.	Direction at time of Max. Vel.	Total.	Heaviest in 24 hours.	No. rainy days
Northern Cities.										
Northfield, Vt.	40.1	63	12	51	7.0	30	N	3.57	1.17	15
Portland, Me.	46.1	68	26	42	8.3	36	S	3.47	1.27	10
New York City	52.1	73	35	38	12.1	34	NW& N	2.53	.67	14
Pittsburg, Pa.	51.0	75	30	45	4.4	21	NW	2.06	.44	14
Chicago, Ill.	49.4	79	35	44	9.5	32	NE	1.82	.82	7
Omaha, Neb.	52.2	84	28	56	6.8	34	NW	0.34	.19	4
St. Paul, Minn.	45.0	56	35	21	6.3	24	W	0.06	.06	1
Duluth, Minn.	42.3	70	25	45	6.3	28	NW	0.34	.28	9
Bismarck, Dak.	47.4	86	23	63	8.9	36	NW	T	T	0
Average	47.3	72.7	27.7	45.0	7.7	30.6		1.58	0.57	8.2
Southern Cities.										
Washington City	52.0	82	34	48	6.0	30	NW	4.48	1.73	10
Louisville, Ky.	56.0	81	31	50	5.3	27	W	1.68	.64	8
St. Louis, Mo.	55.1	84	35	49	9.0	36	SE	1.65	1.05	8
Savannah, Ga.	64.4	87	42	45	5.1	22	N	0.34	.34	2
Leavenworth, Kan.	54.1	87	28	59	4.2	24	NW	1.59	.77	9
Jacksonville, Fla.	67.3	90	45	45	5.6	24	N	1.38	1.26	1
Chattanooga, Tenn.	58.4	82	35	47	5.1	24	N	1.38	.48	8
New Orleans, La.	70.4	90	50	40	7.0	24	N	0.26	.25	2
Memphis, Tenn.	60.8	84	38	46	5.6	28	N	0.75	.54	3
Palestine, Tex.	66.5	89	38	51	5.4	36	SE	1.21	1.20	3
Average	60.5	85.6	37.6	48.0	5.8	27.5		1.46	0.83	5.4
Western Cities.										
Helena, Mont.	51.0	80	30	50	6.0	34	W	0.14	.06	10
Port Angeles, Wash.	49.5	64	32	32	2.2	22	W	3.33	.64	18
San Francisco, Cal.	61.8	87	51	36	8.2	32	SW	7.28	2.01	13
Salt Lake City, Utah	54.2	86	30	56	4.6	28	E	3.85	.98	13
Denver, Col.	51.7	85	25	60	6.0	36	NW	2.11	.91	9
Yuma, Ariz.	72.6	106	47	59	4.8	34	N	0.59	.59	2
Santa Fé, N. Mex.	62.0	78	28	50	6.5	36	N	0.37	.24	6
Average	56.1	83.7	34.7	49	5.5	31.7		2.52	0.78	10.1

*T indicates trace of precipitation.

The prize funds of the Institution are as follows:

1. The Telford fund, left "in trust, the interest to be expended in annual premiums, under the direction of the Council." This bequest (with accumulations of dividends) produces $1,300 annually.

2. The Manby donation, of the value of about $50 a year, given "to form a fund for an annual premium or premiums for papers read at the meetings."

3. The Miller fund, bequeathed by the testator "for the purpose of forming a fund for providing premiums or prizes for the students of the said institution upon the principle of the Telford fund." This fund (with accumulations of dividends) realizes $750 per annum. Out of this fund the Council has established a scholarship called "the Miller Scholarship of the Institution of Civil Engineers," and is prepared to award one such scholarship, not exceeding $200 in value, each year, and tenable for three years.

4. The Howard bequest, directed by the testator to be applied "for the purpose of presenting periodically a prize or medal to the author of a treatise on any of the uses or properties of iron or to the inventor of some new and valuable process relating thereto, such author or inventor being a member, graduate, or associate of the said institution." The annual income amounts to nearly $80. It has been arranged to award this prize every five years, commencing from 1877. The next award will therefore be made in 1892.

A list of some fifty different suggested subjects for papers is also issued.

THE COLOR OF THE EIFFEL TOWER, says the *American Architect*, has been one of the puzzles of the Paris Exposition, no two persons agreeing as to what the real color is. Some people imagine that it has been plated with nickel or silver, while others call it red, and others again think it is of a beautiful bronze color. The fact is that it is painted in five shades of the same color, modulated with the skill that the French often show in cases of the kind. From the base of the first platform the color is a dark "Barbedienne" bronze, verging a little to red: thence to the second platform the color is the same, but lighter; and from this point to the top the color grows constantly lighter, by five successive gradations, the top being almost a golden yellow. Three coats of paint are spread over the entire surface, and over all is a coat of very hard, transparent varnish, which, by reflecting the sun, adds to the difficulty of defining the color.

The Sewerage and Sewage Disposal Works of South Framingham, Mass.

The sewerage system now nearly completed at South Framingham, Mass., includes some interesting work, especially in the disposal of the sewage. The question of establishing sewerage grew out of the taking of the rivers and ponds by the city of Boston for a water supply, and the objections of that city afterwards to having its water supply polluted by the emptying into it of filth and other matter. A joint system between South Framingham and Natick was suggested by the State Drainage Commission appointed in 1884, substantially as it stands to-day, to include the woman's prison if desirable. They recommended that Boston pay $20,000 towards the cost of such a system, and the commonwealth $15,000, the estimated cost being $135,000. Plans and estimates were prepared by Mr. ELIOT C. CLARK, and approved by Mr. JOS. P. DAVIS and Mr. RUDOLPH HERING. In March, 1887, $1,500 was raised for preliminary surveys, which were made by Mr. S. C. HEALD. In August, 1887, Mr. HEALD made a report recommending the adoption of the irrigation system of sewage disposal, the sewage to be pumped from receiving basins to a filtration area. In February, 1888, it was voted to build the system, and to issue bonds for $140,000 for the same, the city of Boston paying $25,000.

The contract for construction was let to Sherman & McDonough, of West Troy, N. Y., amounting to about $41,000; the contract for Akron sewer pipe was awarded to H. L. Sawyer, of South Framingham, for about $12,500. There are 3,108 ft. of 24 x 36-in. brick sewer, 146 ft. of 18-in. pipe, 7,016 ft. of 15-in., 705 ft. of 12-in., 3,361 ft. of 10-in., 10,535 ft. of 8 in., and 270 ft. of 6-in.; also 490 ft. and 228 ft. of 16 and 10 in. cast-iron pipe. There are about 135 manholes in these street sewers. In the 24 x 36-in. sewer there are 6-in. inlet pipes for every 60 ft. in length, and a 6-in. Y branch for every 30 ft. of pipe sewer. Something over 7,000 ft. of the sewer was underdrained, to facilitate the building of the sewer.

The contract for 12-in. iron force main from the pumping station to the filtration field, this being 9,740 ft. in length, for about 400 ft. of 24 x 36-in. brick sewer with underdrain, and for the construction of the storage reservoirs at the pumping station, was awarded to JOHN R. ROOKE of Framingham, the price being, with extra work, about $35,000.

The pumping station is of brick, with hard pine roof trusses. It was designed by Mr. J. B. WOODWORTH, of Worcester; the contractors were S. A. Sweetland, of Natick, and J. E. McCoy, of Boston. The engine room is 30 x 40 ft., boiler room 33 x 53 ft. and screen room 15 x 30 ft.; the smoke stack is 100 ft. high. The contract for pumping plant complete was let to the Davidson Steam Pump Co., of New York, for $6,700. The pumping engines are a pair of the M. T. Davidson compound condensing engines, with independent air pumps and condensers, so arranged that they can be employed as a duplex pump, two single pumps, or one can be entirely shut off and the other left to operate alone and singly, and as the piston speed according to contract can be doubled, it is hardly possible that the operation will be seriously interfered with by breakage or accident. The water cylinders are so constructed that with ordinary care in straining, to keep out the coarser material, it will be impossible to cause stoppage by reason of clogging valves with foreign substances. The water valves are of the swinging or hanging type, and can be taken out and replaced in each pump in not exceeding 15 minutes. The engine has a capacity to pump 2,000,000 galls. of sewage each 24 hours against a head of 45 ft. There are two large pumps, which work separately or together. There are two horziontal, tubular boilers, and the fuel is brought to them in wheelbarrows from the coal shed a few feet away. All the steam pipes are covered with magnesia covering.

The gate-house well is 10 ft. diameter, and from it the sewerage can be directed to either of the two reservoirs or direct to the pumps. The reservoirs are arched, with invert bottoms, built of brick and concrete. Each has a capacity of 200,000 galls. These reservoirs are ventilated into the large chimney or through the boiler fires, the draft for the latter coming in a flue from them. Either or both reservoirs can be easily cleaned out at any time, and in the top of each are two manholes. Another manhole a few feet away from the station, and 14 ft. deep, is filled with clean, clear water, which is strained from the brook a few feet distant, and supplies the boilers with water. From the 10-in. underdrain, which empties a few rods distant into Beaver Dam Brook, comes the clear water which drains from the streets through which the sewers are laid. This has already been of great benefit to South Framingham in draining the land; for while one could strike soil water by digging 3 or 4 ft. a few months ago, now the soil is comparatively dry for a depth of 10 or 12 ft.

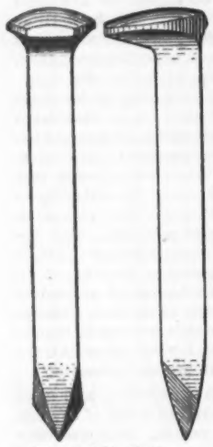
From the station a cast-iron force main extends to the sewage farm, which consists of 70 acres. On the farm, about 150 ft. from the street, the iron force main terminates in a manhole. This is the highest point of the pipe, a height of 40 ft. above the bottom of the reservoirs at the station, and 22 ft. higher than the pumps. From this point the sewage flows by gravity along the 15-in. main line or pipe on the farm. This main line has manholes at intervals of 200 ft., and each manhole has five gates, so that the sewage can be turned in any desired direction upon the prepared fields. The work upon the farm has all been done by the day, under the superintendence of Mr. WM. H. HASTINGS. At present he has men employed in building and grassing the embankments, preparing the fields, some of which are furrowed, etc. There are 11 fields at present, averaging about 200 x 300 ft. in size, or a little over an acre each, and more can be prepared as needed. The farm is well situated on land quite level and admirably adapted for the purpose, being for the most part of gravel or coarse sand, allowing an easy filtration of the sewage.

The sewers can be tapped whenever desired, and the sewage will run through the main sewer into the large manhole, and thence into the reservoirs. It is estimated that for the first year the daily amount of sewage will not be over 200,000 galls., and the pumps are capable of disposing of 84,000 galls. an hour. Thus, inside of three hours the whole daily supply of sewage can be pumped. It is not the idea, however, to pump it in such a volume, but rather to run the pumps easier and more slowly, taking perhaps six or seven hours for it. Broad irrigation will be tried on the grass land at the farms at first, rather than an immediate irrigation of the furrowed fields. It is thought that there will be a large yield of grass on some of the farms, while some of the more loamy fields will doubtless produce large yields of some of the root crops.

Mr. SIMPSON C. HEALD is the engineer, and Mr. J. J. VAN VALKENBURG the engineer in charge.

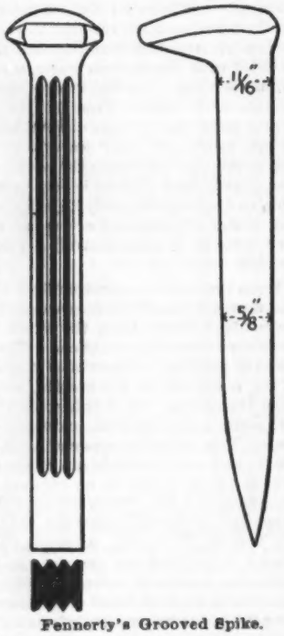
Two New Spikes.

While so simple a detail as a spike would hardly seem to be one leaving room for the exercise of much ingenuity in designing it, yet the total number of patents which have been taken out for them rises into the hundreds, and the two which we illustrate seem to have features entitling them to special attention. In spite of the great attention which has been given to the subject in recent years, there can be no doubt that the present system of spike fastenings for rails is capable of great improvement, and we are glad to see any reasonable attempts to make such improvements; but the extensive experiments made at the St. Louis bridge with numerous forms of spikes prove that it is not so easy to improve the holding power as might be supposed, and that any form of ragging or its equivalent is positively injurious to the holding power.



The Goldie Spike.

The Goldie "perfect" spike, of which we give a cut this week, proceeds upon quite the opposite theory to ragging, its object being to keep the point distinctly narrower in every dimension than the smooth body of the spike, and also to cut rather than to tear the fibres, as the point enters the wood, by making the spike sharp-pointed instead of chisel-edged. Both the edges and faces of the point are on a slope, and it is with reason claimed that the effect of this shaping of the point is to reduce the tearing and breaking of the fibres, so that the increased friction of the uninjured fibres gives a much greater hold to this spike than to one of ordinary form. It is plain that the sloping cutting edges must separate the fibres with very much less abrasion and detrusion of the fibres than the square chisel-edge for the same reason that the cutter of any shearing tool is set on an incline. The spike is manufactured by Dilworth, Porter & Co., Limited, of Pittsburg, Pa., and strikes us as a real improvement on the ordinary form of spike, while its cost is not sensibly if at all increased.



Fennerty's Grooved Spike.

The Fennerty grooved spike, of which we give a cut, is a device aiming at securing a firmer hold of the spike in the tie in another way, by increasing the available bearing area with the same metal by grooving the surface. The grooves are so disposed as to cut and separate smoothly the fibres of the wood without crushing or tearing them, being carried down towards the point so that this cutting (or rather separation of the fibres endwise) may begin below the square shank of the spike. The spike shown is 6¾ ins. long, being intended for heavy track, but they may be made of any desired length. In a single test, made with the Fairbanks testing machine by Mr. N. O. OLSEN, Engineer of Tests and Experiments, 84 Thomas St., New York, four of these spikes, 5¾-ins. long, holding a piece of rail to a tie, required a force of 29,870 lbs. to draw them; four ordinary spikes, which were only 5 ins. long, required 16,500 lbs. One test, however, is no proof of efficiency, and apart from actual service in the track the only way to make a reliable test would be a series of trials, taking their average. Mr. FLAD's tests at the St. Louis bridge showed unmistakably that smooth round spikes held best of all; but this grooved spike appears not to violate this principle, and to have some novel features, and we should be glad to see it given a practical test. The grooving may of course be applied also to dock and trestle spikes, drift bolts, etc. These spikes are to be manufactured by the Standard Iron Co., of Jersey City, N. J.; and it is said that the price will be about the same as that of ordinary spikes.

Two other proposed forms of spikes which we may mention here are a spike of triangular cross-section, the faces being concave, and another spike with a tee head of such shape that while one end rests on the rail flange, the other end rests on the tie. The object of this form of head is to give a bearing on the tie to resist the outward pressure of the rail. Particulars of both these forms of spikes may be obtained of Mr. J. M. HICKS, 19 Park Place, New York.

Important Anthropological Discoveries.

Dr. WRIGHT, at the opening lecture of the course before the New York Academy of Anthropologists, called attention to important recent discoveries of paleolithic implements by Dr. C. C. ABBOTT, of Trenton, N. J. As no account of these discoveries has yet been published, Dr. ABBOTT was requested to state the facts, which he did. It seems that a few days ago he noticed that the Pennsylvania Railroad was making fresh cuttings in the village of Morrisville opposite Trenton. One of these cuttings was through a knoll of Trenton gravel some 12 ft. deep and 200 ft. long. Anticipating that paleoliths would be found, he requested Mr. ERNEST VOLK to watch for them as the work proceeded, preferring that the discoveries should be made by another in order to refute any suspicion as to their genuineness.

When the workmen had reached nearly the entire depth of the cutting Mr. VOLK found imbedded in the gravel a fine paleolith of argillite about 12 ft. below the surface. It was one of those chipped stones, rudely shaped, to give a jagged cutting edge, which are characteristic of the earliest industry of preglacial man; 10 ft. higher than the paleolith and about 2 ft. below the surface Mr. VOLK found a level where chipped instruments had been made by Indians, of course much later, and the chips were left thrown about.

Dr. F. W. PUTNAM, of Cambridge, was telegraphed for, and arrived before the objects were removed. He pronounced them genuine. Photographs were taken, and they were then transported to the Peabody Museum at Cambridge. Paleoliths were also discovered in the bed of the river within 50 ft. of the cutting and only about 2 ft. lower, showing that they belong to the same geological period. The river stones resemble the others, except that they are smoother, being water-worn. The present channel of the river is a recent one, as the course has been changed within a few hundred years.

Reports of Railway Commissions in Southern States.

VIRGINIA.

The State of Virginia entrusts the supervision of the 3,259 miles of railway within her borders to one commissioner, who is clothed with broad but rather indefinite powers, and is expected to do work enough to keep several men comfortably busy. Commissioner HILL says that he and his clerk, Capt. JOHN U. SUMPTER, have done all that was physically possible for them to do, and the rest of their statutory duties they have necessarily left undone. The report proper covers but three pages. The remainder of the volume is devoted to the correspondence which the office has carried on, statistical tables, and the reports made by the various railroad companies.

The investigation of accidents by the Commissioner is referred to as one of the duties devolving upon him, but the law fails to clothe him with the necessary authority to make such an examination as would have results of any value; therefore, this work also is left undone. The numerous complaints which the Commissioner investigated arose chiefly from the disproportion between local and through rates; and he is of the opinion that legislation upon the subject is needed. Legislation on the car heating question, however, he discountenances, for the present at least.

The correspondence regarding complaints, etc., is interesting reading. It is amusing to note how large a proportion of the complaints arise from the pure pugnacity of the aggrieved person. Some overcharge is made, some goods are lost or damaged in shipment, and instead of notifying the claim department in a business-like way and awaiting the proper time for the claim to receive attention, the aggrieved person writes to the railroad company "breathing threatenings and slaughter" if the wrong done him is not righted, and by the same mail pours out his wrongs before the railroad commission. We wonder it has not occurred to some manager of a railway claim department to reprint in pamphlet form extracts from the reports of various State railroad commissions, showing the actual correspondence in some of these ridiculous cases, and send a copy to every claimant who appealed to the commission without due cause. When these fiery denunciations of the railway managers are put in plain black and white, their authors can hardly feel very proud of them.

The amount of the claims were in most cases ridiculously small. One was for $3; another was for $5.25; another was for $5.03. Over each of these claims a lengthy correspondence was carried on, all of which is published. There is some recompense to Commissioner HILL for his careful attention to these petty matters in a letter to him from one of the satisfied claimants, who says: "As far as my knowledge goes, you are the only State official who has ever made any effort to serve the public."

KENTUCKY.

The ninth annual report of the Kentucky Railroad Commission is a well printed and neatly bound volume of 293 pages, about 50 of which are devoted to the report proper. The returns from the various railway companies occupy 180 pages. One noticeable feature in the report of each company is a list of its bridge structures, giving for each its location, number, stream crossed by it, style and material of structure, length of each span, and number of spans. The accident report from each company seems to be especially full and well classified.

There is a fair number of statistical tables; and each table is printed in the report on pages adjacent to the matter to which it has reference. It is not often that the compilers of a public document take so much pains to consult the convenience of readers. The mileage in operation in Jan. 1, 1889, in the State is given as 2,601 miles. A table showing the mileage of the State at the close of each year since 1835 is given, from which we extract the following:

Year.	*Miles.*	*Year.*	*Miles.*
1835	15	1865	567
1845	28	1870	1,017
1850	78	1876	1,475
1855	242	1880	1,530
1860	534	1888	2,601

The valuation of the railway property of the State for purposes of taxation is one of the duties devolving upon the Commission. Several pages are devoted to a description of the difficulties encountered in this work. The representatives of the corporations have recommended to the Commission "that the gross earnings, taken in connection with the operating expenses, the amount of bonded indebtedness, the physical condition of the road, the connections and competition with other transportation routes, the equipment and the future prospects of the road should control the action of the Board of Assessment." The total valuation put by the Commission on Kentucky roads is $42,207,965. The gross earnings of the companies in 1888 were $14,583,075, and the net earnings were $4,948,164.

In inspecting the physical condition of the roads, which is one of the Commission's statutory duties, as much was done as the other duties of the Commission permitted. The accident record shows 8 passengers killed and 38 injured, and 50 employés killed and 535 injured during the year. In discussing couplers and brakes the Commission wisely says: "A solution of the problem of the best coupler ought naturally to come from the Master Car Builders' Association." The introduction of both automatic couplers and power brakes on freight trains is warmly favored by the Commission, but they say that no beneficial action in furthering uniformity can be taken by a single State, and prefer, therefore, to leave the whole matter to voluntary action on the part of the railway managers. If laws to secure uniformity are necessary, Congress and not State Legislatures should take action.

One error, perhaps typographical, on page 43 is the statement that in 1888 a uniform code of train rules was adopted by 85 per cent. of the roads of the country.

The report concludes with an allusion to the organized attempt which was made at the last session of the Kentucky Legislature to repeal the law creating the Commission. A strong and excellent argument is made for the general policy of State supervision of railways by Commissions. Certainly, while the Kentucky Commission continues to perform its duties so well as at present, there is little cause for the railways to agitate for its abolition. Such attempts are well calculated to arouse public and official animosity to the railways; and since it is well settled that the policy of State railroad supervision has come to stay, it is the wisest course not to try to oppose it. A novel feature in the report is an abstract, occupying 13 pages, of the laws of other States creating railroad commissions and defining their powers and duties.

ALABAMA.

The report of the Alabama Railroad Commission for the year ending June 30, 1888, shows commendable progress in various departments of the Commission's work. During the year there were built in the State 530 miles of railroad, most of which mileage was added to the Louisville & Nashville, the East Tennessee, Virginia & Georgia, and the Kansas City, Memphis & Birmingham systems. The total mileage in the State on June 30, 1888, was 2,795.8 miles, so that the increase forms a very large percentage of the whole. There are also 9 dummy line railroads with an aggregate length of 70 miles. The Commission look favorably on this work of extension and hope that the new roads are meeting the expectations of the investors who furnished the money for their construction. The Commission say that they have not deemed tabular statistics necessary or important on many matters. The five tables they do present, however, are well arranged, and exhibit in a condensed form important statistics regarding operating expenses, earnings, accidents, tonnage, train mileage, equipment, and mileage operated.

The greater part of the volume is taken up by the returns of the several railroad companies in the State. The report of the Commission occupies but 42 pages. One line of work in which the Board has been especially prominent is the securing of better passenger depot accommodations and sanitary arrangements. There is certainly much room for improvement in this regard all through the South; and it is so important a matter, when the liability of all portions of the State to yellow fever outbreaks is considered, that the Commission's crusade in the interest of better and healthier depot accommodations is to be heartily commended. During the year, at over a dozen places in the State, new depots have been erected or old ones have been repaired or enlarged at the request of the Commission.

The power of revising tariffs, which is vested in the Commission, has been exercised very cautiously. In several cases, however, at the instance of complaining shippers, examinations have been made and revised tariffs have been put into effect.

Four pages are devoted to a comparison of English railways with American, and Mr. E. B. DORSEY's book is freely quoted.

The heating and lighting of passenger cars are discussed at some length: but the Commission think it best to leave the particular methods of heating and lighting which should be adopted to the discretion of the railway managers.

Page 18 of the report shows that the good seed sown by the Interstate Commerce Commission has borne fruit, and that hereafter the form of return required by the Alabama Commission will be uniform with the return required by the Interstate Commerce Commission. The amount of money which this reform will save in the expenses of railway accounting departments will be very great.

There is encouragement for steel rail makers in the statement that there are still 612 miles in the State laid with iron rails. One serious defect in the tabular statements is that hardly any totals, averages, or percentages are given. It is not easy, therefore, to compare the statistics given with those of other States and know just the standing of Alabama railways as a whole. There is little doubt, however, that these totals, if they were presented, would confirm the statement that railway practice in Alabama is on the whole making rapid advancement.

FLORIDA.

Notwithstanding the fact that the report before us, dated March 1, 1889, is only the second one which has been issued by the Florida Railroad Commission, it is so excellent a document, and shows such progress, that it ought to have been published in a better shape. The report is in pamphlet form, and the printing is below the average of country newspaper work. Of the 219 pages in the volume, 42 are devoted to the report, and the remainder to the correspondence of the office, the circulars issued, the railway statutes of Florida, and the Interstate Commerce law.

The railroad commission law of Florida, which took effect two years ago, gives the Commission control over the rates charged for both freight and passenger traffic, subject only to confirmation or change, on appeal, by a Board of Revision. The supervision of operating details has not yet engaged the attention of the Commission; and indeed they have not yet been given legal authority to interfere with any department of railroad business except the traffic department.

It is evident from the report that the railway companies of Florida, as a whole, are trying to make the best of the situation and abide by the law. The Commission do not publish the reports of the various companies, nor any statistics; and until they do so we cannot judge how the railroads have fared since the fixing of their tariffs was placed in the Commission's hands. We shall hope to find the full statistics in the next report.

The Commission has taken hold of its difficult task with much energy, and while it seems generally to have given shippers the preference in deciding their controversies with the railways, there seems to have been an honest intention to be fair and just. Florida is the only Southern State which has placed such unlimited power over railway rates in a Commission's hands. The final result of the experiment will be awaited with interest.

RAILWAYS.

EAST OF CHICAGO—Existing Roads.

Central R. R. of New Jersey.—C. E. Stewart & Co. of Lancaster, Pa., have the contract for constructing the bridge across the Delaware River at Easton, Pa. The bridge contains about 10,000 cu. yds. of masonry. It is being built for the purpose of connecting the Central R. R. of New Jersey with the Belvidere Delaware R. R., and with its approaches will run from Easton, Pa., to Phillipsburg, N. J. By its construction the C. R. R. of N. J. obtains an eastern outlet for its coal traffic over the Pennsylvania, Poughkeepsie & Boston R. R. and the Poughkeepsie Bridge.——The grading of the extension of the Atlantic branch from Atlantic Highlands to the shore of the North Shrewsbury River has been begun. It is thought that the grading will be finished by spring.

Toledo, Ann Arbor & North Michigan.—A press dispatch states that the branch from Springville to Frankfort, Mich., has been completed and will be opened for traffic soon.

Evansville & Terre Haute.—The line between Evansville and Seymour, Ind., recently completed, will be opened for traffic Dec. 1. Work is progressing on the line from Seymour to Richmond, Ind., 70 miles.

Flint & Pere Marquette.—The work of regrading and changing the gauge of the Port Huron & Northwestern R. R. has been completed from Saginaw City to Port Huron, a distance of 91 miles.

Somerset.—At the annual meeting recently held the following officers were elected: President, JOHN AYER; Clerk and Treasurer, A. R. SMALL; Supt., W. M. AYER; Directors: F. W. HILL, Exeter; A. J. LIBBY, Embden; B. P. J. WESTON, Madison; JOHN AYER, W. M. AYER, Oakland; R. W. DUNN, E. F. WEBB, W. N. DUNN, Waterville; OMAR CLARK, Carratunk; STANTON DAY, Boston; THOMAS FLINT, San Juan, Cal. Construction is now in progress from Carratunk Falls to Bingham, Me., 7½ miles.

Ohio & Mississippi.—Oliver Ferguson & Son have the contract for building the line from River Vale to Bedford, Ind. Work, it is stated, will commence at once.

Pennsylvania.—It is stated that this company will soon commence work double-tracking the Pittsburg, Cincinnati & St. Louis R. R. between Pittsburg and Columbus, O. About 88 miles of the 193 miles has already been double-tracked. On the portion of the road remaining to be improved there are 6 tunnels, all of which will have to be widened.——Surveys are in progress for an extension of the Cumberland Valley R. R. west to the Cumberland Coal region.

Wheeling & Lake Erie.—A meeting of the stockholders of this road will be held Dec. 19 to consider and determine the question of the final terminus of the road, whether it shall be at Wheeling or Bellaire; also regarding a branch to Steubenville; also to consider a proposition to increase the capital stock to $9,000,000 for the purpose of extending the line, constructing branches, increasing machinery and rolling stock, building depots and shops, and paying the bonds of the Toledo Belt Railway Co., assumed and agreed to be paid by the Wheeling & Lake Erie Co.

Old Colony.—It is stated that this company will build a branch from the terminus of the Wrentham branch at North Attleboro, Mass., to a point near Pleasant View.

Canadian Pacific.—A press report states that this company is considering the building of a line from Mattawamkeag, Me., southeasterly to a connection with the Grand Southern Ry. The scheme also includes the purchase of the Grand Southern Ry. The object is to obtain a shorter line to St. John, N. B.

Baltimore & Ohio.—The annual report of this company for the year ending Sept. 30, 1889, shows the following results from operations as compared with the previous year:

	1888.	1889.
Gross earnings	$20,353,491	$21,303,001
Operating expenses	14,200,561	14,810,844
Net earnings	$6,152,930	$6,492,157

Buffalo, Rochester & Pittsburg.—At the annual meeting of the stockholders recently held, the following annual statement was presented for the year ending Sept. 30, 1889:

Gross earnings	$2,021,591
Expenses and taxes	1,430,795
Net earnings	$590,796

Philadelphia & Reading.—The bids for the construction of the extension of the Camden, Gloucester & Mt. Ephraim R. R. to Blackwood, N. J., have been filed in the office of Chief Engineer NICHOLS, Philadelphia. The contract will be awarded this week and it is stated that work will begin at once.

New York, New Haven & Hartford.—The surveys for the branch from Watertown to Woodbury, Conn., 6 miles, have been completed and it is stated that construction will commence soon.

Pennsylvania, Poughkeepsie & Boston.—It is stated that this company has let the contract for building the extension from Slatington to Harrisburg, Pa., to Andrews & Warner. The line is to be completed in ten months.

Central R. R. of New Jersey.—The Orange County R. R. Co., which has recently completed a railway from Greycourt to Burnside, N. J., 10½ miles, has completed its organization by the election of J. W. WATSON, President; MILES G. DEMAREST, of Greycourt, N. Y., General Superintendent; and EMMET HELMS, of Campbell Hall, N. Y., General Manager. The general offices of the company are at 119 Liberty St., New York.

Louisville, New Albany & Chicago.—It is announced that this company has made arrangements for the construction of a line from a point on the line between Salem and Bloomington, Ind., to Indianapolis, Ind. Two lines have been surveyed, and the most favorable will be selected.

Projects and Surveys.

Poughkeepsie & Hudson.—Incorporated in New York to build a railway from a point near Hudson to Poughkeepsie, N. Y., a distance of about 40 miles. It will run through the villages of Livingstone, Blue Stone, Clermont, Upper Red Hook, Rhinebeck, and Pleasant Point.

Goodrich & Wingham.—This company proposes to build a railway from Goodrich to Wingham, Ont., 20 miles.

New York, Ft. Wayne & Chicago.—It is reported that surveys are in progress for this road, which is to run from Ft. Wayne, Ind. to Chicago, Ill.

Wilson Terminal.—This company has been organized to build a railway 2¼ miles long in Niagara County, N. Y. The directors are: THOS. C. WALTON, WALTER N. HARRIS, and HERVEY SANFORD.

Aylmer & Point Burwell.—The surveys have been completed for this road, which is to run from Port Burwell to Kingsmill, Ont., 15 miles, and it is reported that construction will commence at once.

Franklin & Tilton.—CHAS. E. TILTON, of Concord, N. H., has been elected President of this company, which proposes to build a railway from Franklin to Tilton, N. H., about 5 miles.

Dunderberg Spiral.—A company has been formed to build a spiral railway to the summit of Dunderberg Mountain in the Highlands of the Hudson. Among the directors are: HENRY J. MUMFORD, Mauch Chunk, Pa., JAS. MORGAN, 223 Ninth St., South Brooklyn, N. Y., and JACKSON A. NICHOL, 224 Ninth St., South Brooklyn.

Moncton & Prince Edward's Island.—Organized in New Brunswick to build a line of railway from Buctouche, N. B., to Richibucto Cape, where connection will be made with a ferry line to Cape Wolf, Prince Edward's Island.

Philadelphia Seashore.—Incorporated in New Jersey to build a railway from Winslow to Sea Isle City, N. J., a distance of 35 miles. Among the incorporators are: JAS. M. E. HILDRETH, of Cape May, N. J.; M. J. KILLEY, Sea Isle City; and ANDREW BURGEOIS, of Estelleville, N. J.

SOUTHERN.—Existing Roads.

Kentucky Union.—We have received the following information concerning this enterprise from R. T. MCDONALD, of Lexington, Ky., Chief Engineer:

The road is to run from Lexington, via Winchester, Dodge, Clay City, and St. Helens, to Jackson, Ky., a distance of 94 miles. The route is through a rolling country from Lexington east about 30 miles; the remainder of the distance being mountainous. There will be six tunnels from 300 ft. to 1,500 ft. long. There will be a bridge over the Kentucky River with a river span of 300 ft. and two shore spans 105 ft. each. Seven other bridges from 100 to 160 ft. span will be built along the line. All of the right of way has been obtained and about $300,000 of other local aid secured. Mason, Hoge & Meyer, of Frankfort, Ky., have the contract for building the line. About 1,200 men are now at work grading and tracklaying. About 35 miles of track have been laid since Jan. 1, 1889. The road is now open for business from Winchester to Glade, 34 miles, and it is expected to have the entire line completed and in operation by March 28, 1890. The road is being laid with 65 lb. steel rails; all bridges are of steel or iron, and all small openings of masonry. The track is being ballasted with broken stone in the limestone region and with gravel in the sandstone region. The work of construction is in charge of the chief engineer.

Georgia Southern & Florida.—J. S. McTighe & Co., of Memphis, Tenn., who have the contract for building the line from Macon, Ga., to Birmingham, Ala., 130 miles, have sublet 66 miles as follows: To Daniel T. Hartnett, of Memphis, Tenn., 15 miles, to McLaughlin Bros., of Macon, Ga., 5 miles, to Hays Bros., of Kansas City, Kan., 5 miles, to W. S. O'Kieff, of Kansas City, Kan., 5 miles, to Andrews Bros., of Florence, Ala., 5 miles, J. B. Lewis, Mt. Vernon, Ill., 5 miles, to P. J. Coffman, of St. Louis, Mo., 5 miles, to Garvey & Birmingham, of Kansas City, Mo., 5 miles, to W. H. Brooks & Co., of Macon, Ga., 3 miles, to S. A. Campbell, of Memphis, Tenn., 3 miles, N. P. Nelson & Co., of Belleville, Ill., 3 miles, Frank Hallingsworth, of Macon, Ga., 2 miles, and to Southerland & Larne, of Jasper, Ala., 5 miles. The southern extension of the road is now completed from Macon, Ga., to Lake City, Fla., and it is expected that it will be finished to Palatka, Fla., by Dec. 1.

Columbus Southern.—It is stated that arrangements have been completed for the consolidation of this line with the Savannah, Americus & Montgomery R. R. The Columbus Southern R. R. is projected to run from Columbus to Albany, Ga., a distance of 87 miles, and a greater part of the grading has been completed and about 25 miles of track laid. The Savannah, Americus & Montgomery R. R. is now completed from Louvale to McRae, Ga., a distance of 137 miles and construction is in progress from McRae east toward Savannah.

Birmingham, Sheffield & Tennessee River.—A. MITCHELL, of Jasper, Ala., engineer in charge of construction, writes us as follows concerning the line from Jasper, Ala., to a junction with the Georgia Pacific R. R. near Hewitt Station.

The line will be 9½ miles long. The work is generally heavy; maximum grade 80 ft. per mile, and maximum curve 6°. The contract for the grading and masonry has been let to Fudge & Strang, of Kansas City, Mo.; and for the bridging, to Ford & Mason, of Jasper, Ala. About 400 men and 75 teams are now at work on the line. Three miles of the grading have been completed. It is expected that tracklaying will begin about Dec. 1, and the road be completed and opened for traffic by March 1, 1890. A further extension of the line is contemplated, but the terminus and connections have not yet been decided upon.

Atlantic Coast Line.—Bids have been called for for the grading and trestle-work on the extension from Greenville to Kingston, N. C., 28 miles. The work will be divided into four sections of 7 miles each, and the bids may be made for the sections separately or for the whole line. FLEMING GARDNER, of Wilmington, N. C., is engineer in charge of construction.

Staunton & West Augusta.—A correspondent has sent us the following:

The Staunton & West Augusta R. R. Co. has let contracts for the construction and equipment of its road to the New York Mining & Construction Co., of which C. G. DYOTT, of 52 Wall St., New York, is President. This road when completed will be about 250 miles long in Virginia and West Virginia. The construction company named owns a large tract of land in Virginia containing valuable deposits of coal, lime, and iron suitable for Bessemer steel. The ore is very free and yields a high percentage of iron. It is proposed to begin work at once on about 50 miles of this road.

Orlando & Winter Park.—J. H. ABBOTT, of Winter Park, Fla., Chief Engineer, sends us the following concerning the Osceola & Lake Jessup Railway.:

The road is to run from Osceola, Fla., via Gabriella, to Oviedo, Fla., where connection will be made with the Oviedo, Lake Charm & Lake Jessup Ry., a distance of 10 miles. The route is through a pine forest affording light work; maximum grade 1 per cent, and maximum curve 4°. Nearly all of the right of way has been obtained and donations to the amount of $10,000 have been obtained from the city of Orlando. J. H. Abbott, the contractor, has about 100 men at work on the line. About three miles of the grading have been completed. Tracklaying is to begin Dec. 1, and it is expected to have the entire line completed and in operation by Jan. 1, 1890. The work of construction is in charge of J. H. ABBOTT, the chief engineer and contractor.

Eutawville.—A press dispatch from Charleston, S. C., states that a report is in circulation that the contract has been let for the extension of this road from Pregnalls, S. C., south to Savannah, Ga.

West Virginia Central.—It is stated that this company is securing the right of way for its proposed extension from Buckhannon to Charleston, W. Va.

Nashville & Knoxville.—Grading is now nearly completed from Caney Fork to Cookeville, Tenn. The bridge over the Caney Fork River is being rapidly finished. The greater portion of the cross ties have been delivered and will be laid at once.

East Tennessee, Virginia & Georgia.—The annual report of this company for the year ending June 30, 1889, shows a decrease in gross earnings of $191,706 as compared with last year's report. Of the $6,000,000 bonds authorized at the last annual meeting, $2,500,000 have been expended for improvement of property and for terminal facilities, 8,512 tons of 65 lb. steel rails have been substituted for iron rails, and expenditures for depot facilities have been made at Knoxville. The company has added to equipment 14 locomotives, 9 passenger cars, 4 baggage, mail, and express cars, 150 box cars, 550 coal and 100 flat cars. Contracts have been made for additional equipment for winter business.——Work is progressing satisfactorily on the branch road from near Montevallo, Ala., to the Birmingham district, and the road will be open for business early next year. The branch will be about 50 miles long, and will extend to Blockton and Bessemer, near Birmingham.——A press report states that this company has purchased the Rome & Decatur R. R. running from Rome, Ga., to Attala, Ala., 60 miles, and will extend it from Attala west to Decatur, Ala., as was originally intended.

Projects and Surveys.

Southern Coal, Iron & R. R. Co.—We are indebted to LUTHER C. WOLKINS, 74 Tremont St., Boston, Mass., Chief Engineer, for the following data concerning this enterprise:

The projectors propose to purchase or construct a line of railway running from Asheville, N. C., via Waynesville, N. C., Charleston, N. C., and Chilowee and Madisonville, Tenn., to Athens, Tenn., with branches from Chilowee via Marysville and Rockford to Knoxville, Tenn., from Chilowee, via Sevierville and Dandridge, to Morristown, Tenn., and from Charleston, N. C., via Webster to Greenville, N. C., a total distance of 307 miles. About two-thirds of the line has been surveyed and the remainder will be surveyed by May 1. The line is generally favorable, there being few curves and no heavy grades. There will be considerable bridge work and one tunnel of 1,300 ft., so far as the surveys have been completed. But little attempt has been made to secure right of way and other local aid as yet, but as the people along the route are favorable toward the enterprise, it is thought that such aid can easily be secured. It is expected that the road will do a large business in coal, iron, timber, and general freight and passenger traffic. A construction company is now being formed to build the line, and construction will commence about Jan. 1, 1890. It is calculated to have the whole system completed in 2½ years. The company has not yet been fully organized, and all its affairs are in the hands of an executive committee, which is carrying out the preliminary work.

Linville Improvement Co.—Mr. HUGH MCRAE, of Linville, N. C., President, writes us that this company proposes to build a railway from Cranberry to Linville, N. C., 13 miles. About 6 miles of the surveys have been completed and work is now in progress on the remainder. The principal business of the road will be in the transportation of timber with some general freight and passenger traffic. J. R. IRWIN, of Linville, is Chief Engineer.

Yadkin.—Surveys for this road, which is projected to run from Salisbury to Norwood, N. C., a distance of 40 miles, have been commenced. It is stated that the contract for building the line has been let and that the work on construction will commence early in December. The officers of the company, are: G. F. KLUTTZ, of Salisbury, N. C., President, and U. MAUNY, of Milledgeville, N. C., Treasurer.

Atlanta, Asheville & Baltimore.—The surveys have been completed for this road, which is projected to run from Atlanta, Ga., to Roanoke, Va., a distance of 400 miles. It is stated that contracts have been let and grading will be commenced within two month.

Alabama.—A company has been partially organized at Birmingham, Ala., to build a line of railway from that place to the Gulf of Mexico, where connection is to be made with a line of steamers running to New York. THOMAS SEDDON and H. G. BOND, both of Birmingham, are interested.

Nashville Northern.—The city of Nashville, Tenn., has subscribed $81,000 in aid of this enterprise.

NORTHWEST.—Existing Roads.

Wisconsin Central.—The annual report of the Wisconsin Central Co. for the year ending June 30, 1889, shows the following results from operations:

Gross earnings	$3,897,564
Operating expenses	2,604,603
Net earnings	$1,292,961

Milwaukee, Lake Shore & Western.—The extension from Flambeau to Hurley, Wis., 41 miles, has been completed.

Great Northwest Central.—About 10 miles of track has been laid on this Manitoba road from Brandon northwest.

Duluth, Crookston & Northern.—This Minnesota road has been completed from Fertile to Crookston, Minn., 23 miles, and will be opened for traffic soon.

Forest City & Southeastern.—Work is reported in progress on this road from Forest City to Gettysburg, S. D., a distance of ten miles.

St. Paul, Minneapolis & Manitoba.—The annual statement of this company for the fiscal year ending June, 30, 1889, shows as follows as compared with the previous year.

	1888	1889
Gross earnings	$9,561,905	$8,586,565
Operating expenses	5,156,065	4,751,475
Net earnings	$4,405,840	$3,835,090

Chicago & Northwestern.—Most of the grading is now finished on the line from Kasson to Mantorville, Minn., 3 miles. Work is now in progress on a heavy rock-cut which it will take about 3 weeks to complete.

Northern Pacific & Manitoba.—The Brandon-Souris branch has been completed to within a short distance of the Souris River. Work is being pushed on the bridge across the river and it will soon be ready for the rails.

Pacific Short Line.—A press dispatch from Chicago states that this company has let the contract for building a bridge across the Missouri River, at Sioux City, Ia., to J. M. Moest. The bridge will be about 2,280 ft. long and of the combination type, carrying steam and cable car tracks, besides an extra floor for pedestrians and wagons.

Duluth & Winnipeg.—A press dispatch from Duluth, Minn., dated Nov. 13, stated that tracklaying will be completed to the Mississippi River by Nov. 16. The road will then be finished from Duluth to the Mississippi River, 98 miles.

Kansas City, Wyandotte & Northwestern.—The Kansas City and Beatrice R. R. from Summerfield, Kan., to Virginia, Neb., will be completed in a few days. The company has obtained trackage rights over the Chicago, Kansas & Nebraska R. R. from Virginia to Beatrice, Neb.

Projects and Surveys.

Duquoin & Marion.—Surveys are reported in progress for a railway to run from Marion to Duquoin, Ill., a distance of 30 miles.

Sabine Pass & Duluth.—L. T. HUNT, of Springfield, Mo., writes us that the preliminary surveys have been made for this proposed line and that as soon as arrangements can be completed the work will be pushed rapidly. The road is projected to run from Sabine Pass, on the Gulf of Mexico, to Duluth, Minn.

SOUTHWEST.—Existing Roads.

San Antonio & Aransas Pass.—Locating surveys are now in progress on the proposed branch from Kennedy to Laredo, Tex. It is expected that the location will be completed in about a month and that construction will commence soon after.

Fort Worth & Rio Grande.—It is stated that this company has made arrangements for the extension of its line from Comanche, Tex., via Goldthwaite and San Loba, to Llano, 20 miles. The object of the extension is to open up the coal fields along the route.

Omaha, Hutchinson & Gulf.—John Wolf & Co., of Ottumwa, Ia., have the contract for building this road from Kingman, Kan., south. The road is now completed from Hutchinson to Kingman, 31 miles.

Kansas City Suburban Belt.—The grading on this 20 mile railway around Kansas City, Mo., is finished. J. W. HEYLMAN, of Kansas City, is Chief Engineer.

St. Louis, Grand Tower & Southern.—This company has been reorganized with the election of the following officers: S. H. BRACY, Vice-President and General Manager; M. W. PORTERFIELD, Secretary; B. G. BRACY, Treasurer; and T. E. BRACY, Superintendent of Construction. It is announced that the money necessary to complete the road has been secured, and that construction will commence at once. The general offices are at 811 Chestnut St., East St. Louis, Ill.

Projects and Surveys.

Seneca & Nemaha Valley.—Incorporated in Kansas

to build a railway from Topeka northwest to the northern boundary of the State, through the counties of Shawnee, Jackson, Pottawatomie and Nemaha, a distance of about 85 miles. Among the directors are: GEO. W. WILLIAMS, of Seneca, Kan., C. S. CUMMINGS, of Centralia, and J. M. KENDALL, of Corning, Kan.

Fort Worth & Albuquerque.— It is stated that the contract for grading 100 miles of this road has been let to Mallory & Cushing, of Omaha, Neb. CHAS. C. BLACK, of Fort Worth, Tex., is President.

ROCKY MT. AND PACIFIC.—Existing Roads.

Spokane Falls & Northern.—Surveys are in progress for the extension of this road from Colville east to the Metaline country, about 40 miles. The road is now completed from Spokane Falls to Colville, Wash., 88 miles, and construction is in progress 15 miles north of Colville.

Oregon Railway & Navigation Co.—Tracklaying on the Washington & Idaho R. R., from Tekoa, Wash., to Mullan, Idaho, is progressing at the rate of 2 miles per day. The grading has been completed for 80 miles.

St. Paul, Minneapolis & Manitoba.—It is now reported that this company will build a line from Helena, Mont., to Mullan, Idaho, where connection will be made with the branch of the Oregon Ry. & Navigation Co. now being built to that place, and will obtain an outlet to the Pacific coast by that road.

Burlington & Missouri River.—Amended articles of incorporation have been filed for the Denver, Utah & Pacific R. R. Co., which now operates a line of railway from Denver to Lyons, Col. The amended articles provide for the extension of the line into Middle Park, with branches extending southward into the Gunnison region.

Union Pacific.—It is reported that this company is laying rails and ties on the abandoned portion of the Colorado Central R. R., between Fort Collins and Cheyenne, Wyo.

Canadian Pacific.—Surveys are reported in progress for the Kootenai & Columbia River, R. R., for which this company obtained a charter and land grant from the Provincial Government at the last session of the legislature. The proposed line will run from Nelson to Sprout's Landing, B. C.

Projects and Surveys.

Idaho, Nevada & California.—W. J. HIGHLANDS, of 5 Euclid Ave., Cleveland, O., sends us the following data:

This road is to run from Battle Mountain, Nev., to Big Payette Lake and Butte, Mont., via Tuscarora, Nev., South Mountain, Silver City, and Salmon City, Idaho. The total length of the road will be 600 miles, of which 365 miles are under survey. The work will be light. The principal business of the road will be in coal, lumber, and ores. The right of way has all been obtained and $12,000 local aid secured. The officers of the company are: C. W. HINCHLIFF, of Austin, Nev., President; GEO. SHARPE, of Park City, Idaho, Vice-President; W. J. HIGHLANDS, Cleveland, O., Secretary; SAMUEL P. DUNN, East Aurora, N. Y., Treasurer; and C. W. IRISH, Reno, Nev., Chief Engineer.

Point Pedro & Eureka.—A correspondent writes us that a company will soon be formed to build a railway from Point Pedro, Cal., via Petaluma, Sebastopol, and Healdsburg, to Eureka, Cal., with a branch from Sebastopol to Santa Rosa.

Portland & Puget Sound.—This company has filed articles of incorporation in Washington. The object of the corporation is to construct a line of railway from Portland, Ore., to Seattle, Wash., with a branch up the Lewis River, also other branch lines to Gray's Harbor and Port Townsend.

Fresno & Monterey.—Steps are being taken to form a company to build a railway from Fresno to Monterey, Cal., a distance of 130 miles.

Aspen Southern.—Incorporated in Colorado to build a railway from Aspen to Ashcroft, Col. The directors are: H. A. W. TABOR, R. S. RIAN, J. S. PUSSEY, P. McCOMT, and M. A. WALKER, all of Denver.

FOREIGN.

Monterey & Mexican Gulf.—Track has been laid on this road from Monterey, Mex., southeast, 78.2 miles. The road is now under construction from the end of track to Tampico, 350 miles, and from Monterey to Venadito, 67 miles. WM. WENTWORTH, of Monterey, is Chief Engineer.

Peru.—The Government has authorized a contract for the construction of a railroad, either broad or narrow-gauge, from the wine-growing districts of the Department of Moquega to the port of Ilo. This authorization includes the right to construct any branch roads deemed desirable.

Mexico.—It is reported that the Department of Public Works has granted a concession for a railway to run from Guatemala to the United States boundary, with branches east and west. The subsidy promised is $8,000 per kilo.

Guatemala.—Surveys are in progress for a railway to run from the city of Guatemala north to a connection with the Mexican Pacific R. R. at the Mexican border.

Bagdad & Matamoras.—The Mexican Government has authorized the construction of a railway from Bagdad, on the Gulf of Mexico, to Matamoras, Mex.

Cape Colony.—Contracts have been entered into for the extension of the railway from Kimberly to Vryburg, in Bechuanaland. The road will open up a fine mineral and agricultural country.

Yucatan.—Mr. JOHN W. GLENN, of New Orleans, La., and Merida, Yucatan, who is engineer and contractor for the railway extension between Tekanto and Izamal, has not sublet the contract advertised. He left New Orleans for Merida on Nov. 20, with a complete organization for carrying out the work. There are now in this Mexican State six railways, aggregating about 300 miles in length. One road is of 4 ft. 8½ ins. gauge, and the others 3 ft. 6 ins. gauge.

RAPID TRANSIT.

Elevated Railways.—***New York, N. Y.***—The Suburban Rapid Transit Ry. Co. will extend its road to Fordham as soon as the city has the street graded above 170th St.

Jersey City, N. J.—The Central Elevated Transit Co. has applied for a right of way from the Jersey Central ferry at Communipaw to Westside Ave. The line is to be operated by cables or electric power. President, A. C. CHENEY, Garfield National Bank, New York.

Chicago, Ill.— It is reported that the promoters of the Lake St. line now want to build their road on some other plan than the Meigs system; but the city authorities consider that this cannot be done without a new ordinance.

Montreal, Canada.—An elevated cable road is projected on Craig St., from Lachine to Maisoneuve.

Cable Railways.—***Pittsburg, Pa.***—The Pittsburg & Castle Shannon Ry. Co. proposes to build a cable road as a feeder for the new Castle Shannon incline.——The Pittsburg & Birmingham Traction Co. has been granted a franchise for a cable line from the Pennsylvania union depot across the Monongahela bridge at Smithfield St. to the South Side.

Street Railways.—***New York, N. Y.***—The East River, Central Park & North River Ry. Co. has been organized to build a double-track line 5 miles long from E. 54th St., crossing Central Park at the 85th St. transverse road, along 79th St. to the North River and back by 61st St. to the East River. Capital stock, $500,000. The directors are: AARON S. BALDWIN, of Hoboken; JOHN M. COONAN and JOHN LEE, of Brooklyn; ED. O'BRIEN, of Jersey City; ED. KELLY, BARTHOLOMEW F. KENNEY, JOHN P. FLANNERY, JAMES KEHNAN, and EMIL SCHWAB, of New York

Buffalo, N. Y.— The mayor has approved the franchise of the Buffalo Surface & Cable Ry. Co.

Washington, D. C.—The Metropolitan Ry. Co. has decided to make a trial of the Judson pneumatic system on Brightwood Ave. The proposed road will be 1¾ miles long, single track, with switches and turnouts. It will be built at the end of 7th St., where the cable road terminates. Mr. ROBERT GILLHAM will be in charge of the construction.

Murfreesboro, Tenn.—The Murfreesboro St. Ry. Co. has been organized by T. B. FOWLER, P. P. MASON, and WM. MORROW.

Knoxville, Tenn. — The Middlebrook St. Ry. Co. has been organized to build a street railway to North and West Knoxville. SAMUEL MCKINNEY, T. S. WEBB, and H. H. TAYLOR are interested.

Newnan, Ga.—The bill to incorporate the Newnan St. Ry. Co. has passed the Senate.

Chicago, Ill.—The Chicago, Lake View & Evanston Tramway Co. has been incorporated by J. W. DYRENFORTH, P. C. DYRENFORTH, and S. E. HIBBEN. Capital stock, $1,000,000.

Baker City, Ore. — A street railway is to be built by J. E. FRICK, SAM WHITE, and M. L. ROBINSON.

Spokane Falls, Wash.—The Ross Park St. Ry. Co. has been incorporated by H. N. BELT, CYRUS BARNES, and G. B. DENNIS. Capital stock, $125,000.

Houston, Tex.—The Houston City St. Ry. Co. and the Bayou City Ry. Co. are building extensions.

Electric Railways.—***Portland, Me.***—An electric road is to be built on Peaks Id., in the harbor.

Springfield, Mass.—The Springfield St. Ry. Co. proposes to extend its lines and to adopt electricity on one of the extensions.

Newport, R. I.—The Newport St. Ry. Co. has increased its capital stock from $75,000 to $100,000.

Greenwich, N. Y.—An electric road from the depot to Middle Falls is projected.

Matteawan, N. Y.—The proposed line will probably be built next spring. The storage battery system of the Union Electric Car Co., of Boston, is being investigated.

West Orange, N. J.—Mr. EDISON will make experiments in operating the cross town line by electricity.

Reading, Pa.—The City Passenger Ry. Co. has decided to adopt electric traction. The contracts for the electric plant and motors will be let during the winter, and by spring they expect to have the new plan in operation. Overhead wires will be used and motors be attached to the cars now in use. The company has 16 miles of tracks.

Johnstown, Pa.—The street railway has been purchased by T. L. JOHNSTON, of Cleveland, O., who will operate the line by electricity.

McKeesport, Pa.—An electric line 10 miles long is to be built to Dravosburg, Reynoldton and Duquesne. It will cost about $150,000.

Atlanta, Ga.—The West Atlanta Electric Ry. Co. has adopted the Daft system.

New Orleans, La.—The Crescent City Ry. Co. has received a proposition from the Electric Traction & Mfg. Co. for the operation of its road.

Omaha, Neb.—The street railway company proposes to extend its lines and equip the extension for electric traction.

Salt Lake City, Utah.—The street railway company has just contracted for 9 miles of extensions for electric purposes, and proposes by spring to have nearly 20 miles in operation.

Puyallup, Wash.—The Washington St. Ry. & Construction Co. has been incorporated by JAMES KNOX and P. FRANKS, of Puyallup; C. T. UHLMAN, of Tacoma, and others. Capital stock, $1,000,000.

Salem, Ore.—The Capital City St. Ry. Co. has adopted the Sprague system, and has made a contract with Shurtz & Tobin, of Portland, for the plant. J. E. McCOY has the contract for grading.

Seattle, Wash.—The Seattle & Tacoma Electric Ry. Co. is having its line surveyed. President, CHAS. H. FRENCH; Secretary, L. H. RANDALL.

HIGHWAYS.

Westchester County, N. Y.—The following proposals for the construction of the Bear Swamp road in Westchester County have been received by W. H. BIRCHALL, of Bronxdale: Byron & Co., Mt. Vernon, $17,478; Joseph Paladina, Williamsbridge, $18,000; Daniel Murray, Portchester, $18,067.50; Thos. Smith & Patrick Hannagan, Williamsbridge, $18,591.80; Mallory Bros., New Rochelle, $18,987; P. V. Murray, New York City, $26,400.

Indiana.—Lincoln and Middle townships in Hendricks County have voted in favor of laying the Brownsburg and Indianapolis gravel road.

CONTRACTING.

Street Work.—***Brooklyn, N. Y.***—The following proposals have been received by the Commissioner of City Works: Grading and paving Hopkinson Ave.; Daniel Gallagher & Son, $4.70 per lin. ft.; Dennis Norton, $4.10; Charles Hart, $4.——Grading and granite block pavement on Wallabout St.: T. A. Smith, $12.50 per lin. ft.; Thomas Monahan, $11.19; Dennis Nolan, $11.75; E. J. McKeever & Co., $10.60; J. F. Gillen, $10.74; Charles Hart, $10.65.——Flagging sidewalks, John Morrissey, 24½ cts. per sq. ft.

Kansas City, Mo.—Contracts for paving have been let to J. B. Smith & Co., at $1.47 and $1.45 per sq. yd.

Lighthouse.—The following proposals for the metal work of the Newport News lighthouse have been received by Capt. J. C. MALLERY, U. S. Lighthouse Engineer, Baltimore, Md.: Russell Wheel & Foundry Co., of Detroit, $17,830; West Point (Pa.) Foundry Co., $80,800; Tawny (Pa.) Iron & Metal Co., $20,240; Phoenix Iron Co., Trenton, Pa., $23,350; Coldwell, Wilcox & Co., Newburg, Pa., $21,500; Bullan's Iron Foundry, Providence, R. I., $19,500; Detrick & Harvey, Baltimore, $20,623; L. S. Allison, Hazleton, Pa., $19,890; Allentown (Pa.) Rolling Mills, $19,941; Morris, Tasker & Co., Philadelphia, $23,900.

Sewer Blocks.— The following proposals for blocks for the Pulaski St. sewer have been received by the City Commissioner, Baltimore, Md.: Bergman & Kepner, $103 per 1,000; McClenahan & Bros., $130; W. F. Weller, $159; Guilford & Waiterville Granite Co., $160.

Supplies.— The Bureau of Provisions and Clothing, Navy Department, Washington, D. C., has awarded contracts as follows: A. G. & J. N. Waters, Georgetown; 1,700 bbls. of cement at 92 cts.; 100 bbls. of lime at 85 cts. J. T. Summers, Washington, 3,000 bbls. of sand at 11¾ cts.

Piers.— The Commissioner of City Works, Brooklyn, N. Y., has received the following proposals for sheathing the pier at the foot of Noble St.: John W. Flaherty, $1,350; B. S. Cronin, $990; J. D. Walsh, $963; Hugh Hart, $943.

The Docks Commissioners, New York City, have received the following proposals for a new wooden pier at W. 50th St., North River: B. S. Cronin, $38,450 for pier, 70 cts. per cu. yd. for riprap; John Gillies, $40,600, 70 cts.; P. Sanford Ross, $41,990, 75 cts.; W. P. Kelly, $42,893, 70 cts. The contract was awarded to B. S. Cronin.

Brick.—John A. Day, of Belleville, Ill., has contracts for 100,000 brick for the Murphysboro Electric Light & Water-Works Co., and 200,000 for the Duquoin Gas & Electric Light Co.

Steel.— Secretary TRACY has awarded to Carnegie, Phipps & Co., of Pittsburg, two contracts at $65,856 each for steel plates for use in the construction of the cruisers to be built at New York and Norfolk, and two for steel shapes at $20,160 each. The Linden Steel Co., of Pittsburg has obtained two contracts for steel shapes at $27,664 each.

Levees.—Illinois.—At Pekin Mr. OSWALD is staking out the line for the levee around the La Marsh drainage district; it will enclose 3,000 acres of low land for reclamation.

Louisiana.—The State Board of Engineers, at Baton Rouge, will receive proposals for the construction of levees at Longwood and Pecan Grove.

Texas.—The Trinity Valley Improvement Co. has been

organized at Dallas to straighten the Trinity River and build levees for reclaiming 100,000 acres of land at a cost of $1,500,000.

Jails.—A new jail is to be built at Juneau, Dodge County, Wis.——At Baraboo, Wis., the Sauk County Board of Supervisors will build a new jail at a cost of $25,000. The plans have been prepared by Milwaukee architects.——At Louisburg, N. C., the County Commissioners will have new cells put in the jail.——Iron cells are to be put in the city jail at Bessemer, Ala. Address J. C. HOUSTON, City Clerk.

Bonds.—Hamilton County bonds, 30 bonds of $500. F. RAINE, County Auditor, Cincinnati, O. Dec. 7.

Boilers.—Two pairs of horizontal tubular boilers and appurtenances for stationary hoisting engines at Shaft No. 25, J. C. DUANE, President Aqueduct Commissioners, 280 Broadway, New York City. Dec. 11.

Tunnel.—Under the Chicago River; 1,513 ft. long, 30 ft. wide, 15 ft. 9 ins. above rail level. Engineer, SAMUEL G. ARTINGSTALL, 23 Rialto Building. CHARLES T. YERKES, President, West Chicago St. Ry. Tunnel Co., 444 North Clark St., Chicago, Ill. Dec. 16.

Sewers.—*Tarrytown, N. Y.*—The following proposals for constructing pipe sewers have been received by Mr. H. FISHER, the engineer:

Bidders.	8-in. pipe laid complete	10-in. pipe laid complete	12-in. pipe laid complete	Earthwork per cu. yd.	Rock (extra) per cu. yd.	Man-hole, 8 ft. deep	Flush tanks, 8 ft. deep	Lamp hole 8 ft. deep	Brick-work per 1,000	Concrete per cu. yd.	Timber, per M ft. B. M.	Rendering, per sq. yd.	Totals
	$	$	$	$	$	$	$	$	$	$	$	$	$
John B. Heely	1.15	1.15	1.35	0.70	4.00	46	84	20	7	6.00	35	0.00	
John J. Canning	0.55	0.74	0.95	0.62	3.50	50	65	18	18	13.00	50	.50	10,480.00
E. McElmeel	0.25	0.32	0.43	0.75	2.25	48	110	10	17	4.00	32	.50	23,256.00
Henry E. W. Gemer	0.27½	0.36	0.40½	0.50	7.00	42	68	9	16	7.50	25	.25	14,513.84
Benjamin F. Vrankien & Duall	0.19	0.25	0.30	0.25	2.90	28	45	6	16	6.00	30	.25	7,558.00
John W. Devlin	0.65	2.00	1.62	0.30	4.00	30	35	18	8	5.00	15	.60	15,157.30
Everson & Isdell	0.22	0.30	0.40	0.60	3.90	48	90	15	16	7.00	25	.25	16,500.00
Thomas F. McGregor	0.20	0.25	0.30	0.50	4.00	40	66	8	15	4.00	30	.30	12,300.00
I. Small	0.16.75	0.22½	0.28½	0.38	2.75	50	77	10	24	7.50	40	.25	7,954.36
James Cisco	0.50	0.70	0.90	1.00	3.25	75	85	10	...	...	...	...	10,626,00
J. B. Moore	0.40	0.45	0.70	0.25	3.00	40	45	30	14	4.00	20	3.00	22,500.00

PROPOSALS OPEN.

Ties and Posts.—Ties, switch ties, and fence posts. D. POTTINGER, Chief Superintendent, Intercolonial Railway, Moncton, N. B. Nov. 25.

Canal.—Repairing second level and State ditch of the Cayuga and Seneca Canal, at Seneca Falls. JAMES SHANAHAN, Superintendent of Public Works, Albany, N. Y. Nov. 26.

Street Work.—Flagging sidewalks, etc. J. P. ADAMS, Commissioner of City Works, Brooklyn, N. Y. Nov. 27.

Sewers and Street Work.—E. M. BIGELOW, Chief of Department of Public Works, Pittsburg, Pa. Nov. 27.

Street Work and Sewers.—No. 1: 6,000 cu. yds. earth and 11,000 cu. yds. rock excavation, 210,000 cu. yds. filling, 18,000 lin. ft. curb stone, 62,000 sq. ft. flagging, 600 cu. yds. dry rubble masonry, 60 lin. ft. of stoneware pipe. No. 2: 980 lin. ft. of brick sewer 30 x 20 ins., 40 lin. ft. of 18-in. pipe and 720 ft. of 12-in. pipe, 17 manholes, 210 spurs, 4 basins, 2,500 lin. ft. of piling, 10,000 ft. timber, 350 cu. yds. rock excavation, 10 cu. yds. concrete, 25 cu. yds. broken stone. No. 3: 105 lin. ft. of 30-in. brick sewer, 350 lin. ft. of 18-in. pipe, 20 ft. of 15-in., 40 ft. of 12-in., 4 manholes, 50 spurs, 2 basins, 2,000 ft. B. M. timber, 5 cu. yds. concrete, 10 cu. yds. broken stone. No. 4: 800 lin. ft. curb, 2,840 sq. ft. flagging, 750 sq. ft. bridge stones. THE PARKS COMMISSIONERS, 49-51 Chambers St., New York City. Nov. 27.

Asphalt Paving.—On concrete foundation, and over stone pavement. THE COMMISSIONER OF PUBLIC WORKS, 31 Chambers St., New York City. Nov. 29.

Canal Boats.—Bids for purchase of old canal boats. F. M. KELLEY, General Eastern Agent, Philadelphia & Reading R. R., Port Richmond, Philadelphia, Pa. Nov. 30.

Electric Lights.—For street lighting, for 1, 3 or 5 years. Separate bids for the city and surburban districts. GEO. H. ALLEN, Superintendent of Lamps, City Hall Boston, Mass. Nov. 29.

Piles.—To be used in the rebuilding of the Light St. bridge. A. E. SMYRK, City Commissioner, Baltimore, Md. Nov. 30.

Building.—Trench excavation, concrete foundations and stone and brick work of the United States court house and post-office building at Birmingham, Ala. J. H. WINDRIM, Supervising Architect, Treasury Department, Washington, D. C. Dec. 2.

Trestle.—Pile trestle over Squak Creek; 200 ft. long, 16 ft. wide. THE COUNTY AUDITOR, Seattle, Wash. Dec. 3.

Granite.—For bulkhead or river wall; 486 headers, 448 stretchers; about 20,000 cu. ft. THE DOCKS COMMISSIONERS, Pier A, North River, New York City. Dec. 4.

Bridges.—Substructure and superstructure for two highway bridges. Plans and specifications on file. J. C. COPE, County Auditor, Vernon, Ind. Dec. 4.

Building.—Iron work of tower and dome of United States building at Denver, Col. J. H. WINDRIM, Supervising Architect, Treasury Department, Washington, D. C. Dec. 5.

Road.—Grading county road. F. J. O'FLAHERTY, County Surveyor, Kansas City, Mo. Dec. 5.

Bridge.—Larimer St. bridge over Cherry Creek; 3 trusses, 23 ft. deep c. to c. of chords, 111 ft. c. to c. of end pins, 2 roadways 24 ft. wide, 2 sidewalks 13 ft. wide. F. B. CROCKER, President, Board of Public Works, Denver, Col. Dec. 5.

Dredging.—Removing 111 cu. yds. of ledges from Boston harbor. Lieut.-Col. S. M. MANSFIELD, U. S. Engineer Office, Boston, Mass. Dec. 7.

MANUFACTURING AND TECHNICAL.

Market Prices.—***Rails.***—New York and the East; $33 to $35.——Pittsburg; $35; old rails, $29.——Chicago; $37 to $37.50 for present shipment $35 for 1890; old rails, $26 to $26.25 for iron, $19.50 to $20 for steel.

Track Material.—Pittsburg; spikes, 2 15 cts. on cars, or 2.25 cts. at Cincinnati, St. Louis, and Chicago; splice bars, 2 cts.; track bolts, 3 cts. with square and 3.10 cts. with hexagon nuts.——Chicago; splice bars, 2.25 to 2.50 cts. for steel, 2 to 2.05 for iron; spikes, 2.25 to 2.30 cts.; track bolts, 2.85 to 2.90 with square and 2.95 to 3 cts. with hexagon nuts.

Structural Iron.—Pittsburg; angles, 2.35 cts.; tees, 2.75 cts.; channels, 3.10 cts.; sheared bridge plates, 2.70 cts. bars, 1.80 cts. to 1.90 cts.; tank and plate, 2.35 cts. to 2.40 cts; No. 24 sheet, 2.95 to 3 cts.; skelp, 1.85 to 1.90 cts. for grooved and 2.15 to 2.25 cts. for sheared, all 60 days, 2 per cent. off for cash.

Filters.—The large National filter plants put in for the Muncie Pulp Co., at Muncie, Ind., and the Philadelphia Company Building at Pittsburg, Pa., by the National Water Purifying Co., are now in satisfactory operation. The Spiral Weld Tube Co., of East Orange, N. J., has placed an order for one of these filter plants.

Cable Railway Yokes.—The Centropolis Car & Machine Co., of Centropolis, Mo., has completed a contract for 27,000 cable yokes for a Denver line.

Sewer Pipe.—The Denver Sewer Pipe & Clay Mfg. Co. has been incorporated at Denver, Col., as a branch of the Laclede Works of St. Louis. The company will manufacture sewer pipe, irrigating pipe, fireproofing and other articles in that line. It is also the intention to manufacture a vitrified brick, which is now coming into popularity as a material for paving streets. Kansas and Nebraska are laying more pavements with this brick than with any other material. The building to be erected will be 200 x 80 ft., three stories high. It will be supplied with two boilers of 150 H. P., and engine of 150 H. P., and complete plant for the manufacture of sewer-pipe, etc. President, JAMES GREEN; Vice-President and General Manager, JAMES H. GREEN; Secretary, CHARLES SULLIVAN.

Steel Plant.—The American Association, of Knoxville, Tenn., proposes to establish a basic steel plant at Middlesborough, Ky.

Electric Headlights.—The St. Louis, Vandalia & Terre Haute will equip two engines with a new form of electric headlight, and if it proves successful it will be fitted on all the passenger engines. The cost is $350 per engine.

Gas Wells.—The Henderson County Natural Gas Co., of Henderson, Ky., wants several wells bored, and invites correspondence with contractors.

Granite.—The Welsford Red Granite Co. has been organized at St. John, M. R., by BRUNSWICK SANCTON, of New York; A. I. TRUEMAN, J. A. CHESLEY and JOHN CONNOR, of St. John. Capital stock, $50,000.

Logging Railways.—The Satsop Railway Co., of Seattle, Wash., has been organized to build logging roads.

Locomotives.—The Brooks Locomotive Works, of Dunkirk, N. Y., are building some ten-wheel engines for the Cleveland, Cincinnati, Chicago & St. Louis, and 4 freight engines for the Lake Shore & Michigan Central.

The Baldwin Locomotive Works, of Philadelphia, Pa., are building 7 passenger engines for the Louisiana division of the Southern Pacific.

The New York Locomotive Works, of Rome, N. Y., have delivered some more standard gauge engines to the Rio Grande Western. They are of the mogul type, with cylinders 20 x 24 ins., 4½ ft. drivers, wagon top, ⅝-in. steel boiler, with 230 2-in. flues, a shell diameter at the front flue sheet of 68 ins., and have been tested at 210 lbs. pressure. The total wheel base is 47 ft., the tender tank holds from 2,800 to 3,000 galls. of water, and the running weight of engine and tender is over 70 tons.

Cars.—The Jeffersonville Car Works, of Jeffersonville, Ind., have an order from the Georgia Central for 1,200 freight cars and 22 passenger cars.

The Litchfield Car & Machine Co. has finished cars for the San Diego, Cuyamaca & Eastern, and the Cairo Short Line.

The Terre Haute Car Co., of Terre Haute, Ind., is working on 100 stock cars for the Cleveland, Cincinnati, Chicago & St. Louis; they will be 34 ft. long and equipped with air brakes and automatic couplers.

The Centropolis Car & Machine Co., of Centropolis, Mo., is building 75 cars for the Kansas City & Southern and is at work on 50 box cars, 50 refrigerator cars for the Dold Packing Co., of Kansas City, and 10 electric motor cars. Mr. EHMBOHM is Superintendent of the street car department.

The Lima Car Co., of Lima, O., has an order for 500 cars for the Pennsylvania Co.

Signals.—The Gould-Tisdale signal, noticed under this heading last week, is manufactured by the Gould Tisdale Revolving Semaphore Co., of Boston, Mass.

The Union Switch & Signal Co., of Pittsburg, Pa., has made a 92 lever machine for the Grand Central Depot, New York, and is at work upon the largest electro-pneumatic signaling and interlocking table yet constructed, for the Union Depot at Kansas City, Mo.

Electric Train Call.—The passenger cars on the New York & New England R. R. have been fitted with an electric system connecting with a small steam whistle in the cab. The bell-rope will give place to the push-button.

Pumps.—The Snow Steam Pump Co. has been organized at Buffalo, N. Y., and will manufacture and sell pumps, castings, and pipes and other mechanical appliances. The capital stock is fixed at $100,000, divided into 1,000 shares. The trustees for the first year are DANIEL O'DAY; and GERHARD LANG, of Buffalo; JAMES H. SNOW and AUGUST C. CHRISTENSEN, of Brooklyn, N. Y., and ABNER L. ELLIS, of Oil City, Pa. The incorporators include besides the above-named persons, JOSEPH SEEP of Titusville, Pa., and MICHAEL GEARY, of Oil City, Pa.

Valves.—The Eddy Valve Co., of Waterford, N. Y., has a government order for 48 valves.

Brakes.—The Westinghouse automatic brake is now in use on 20,000 engines and 185,000 cars, the latter including 85,000 freight cars. There are now 35,000 of the improved quick action brakes on freight cars.

Train Lighting.—The Hocking Valley R. R. Co. has awarded a contract to W. L. Silvey, of Lima, O., for the equipment of 100 passenger cars with 12 lights each on his system of electric lighting.

The Strong Locomotive.—The Strong locomotive which made a trial trip between New York and Buffalo, a continuous run of 444 miles, is to be placed on the Bee Line for a test. After that the locomotive will make a test run over the Missouri Pacific. The aim is said to be to haul a train of 18 coaches at 60 miles an hour. The New York and Buffalo trip was described in ENGINEERING NEWS, April 6, 1889.

The Edge Moor Bridge Works, of Wilmington, Del., have completed their new shops and shipped from them during the month of October, 7,765,933 lbs. of finished bridge material. The new shops are designed for the manufacture of the riveted portions of bridges, and cover more than 2¼ acres of ground.

Railway and other Material Wanted.—Steel rails, 500 ft. of 58-lb. rails, 30 ft. long; spikes, 24-in. angle bars, bolts and nut locks, Carlisle rotary switch stand, 9½ frog, split switch. CHAS. N. VAUGHT, Horace Rainey & Co., Columbia, Tenn.

Rails, bolts, splice bars, etc., for street railway; 20,000 ft. of 30-lb. tee rails and 18,000 ft. of 30-lb. flat rails. TRAVIS JONES, Waco, Tex.

New or second hand rails, 16 to 30 lb. per yd., for 1 mile of street railway; 3 cars. Somerset St. Ry. Co., Somerset, Ky.

Logging locomotive, for flat wood track. J. H. Lawson, Talledega, Ala.

Small air compressor; M., Box 663, Yonkers, N. Y.

Hot air engine; 3 or 4 H. P. E. R., Box 29, *World* office, New York City.

Portable engine, 8 to 10 H. P. O 590, *Sun* office, Baltimore, Md.

Second-hand engines, 16 x 42 in. cylinder, Corlis cut-off. P. O. Box 515, Boston, Mass.

Second-hand engine, 25 H. P. Hodgman Public Co., 459 Broadway, New York City.

Horizontal engine, 200 H. P. P. O. Box 577, Jersey City, N. J.

BRIDGES AND CANALS.

Bridge Notes.—*Lowell, Mass.*—The Locks & Canals Co. will build an iron highway bridge at Merrimac St.: 34-ft. span, 70 ft. wide, with two sidewalks. Mr. GEO. F. EVANS, City Engineer, can furnish particulars.

Glens Falls, N. Y.—The Highway Commissioners will build an iron bridge between Queensbury and Moreau; high truss, 175 ft. clear span, 26 ft. roadway, two 6-ft. sidewalks, 100 lbs. capacity per sq. ft.; wheel capacity, 4 tons per wheel.

Philadelphia, Pa.—The Union Passenger road will build a bridge over the Philadelphia & Reading tracks at 9th St.

Reading, Pa.—The County Commissioners have been requested to build the bridge at the foot of 6th St.

Easton, Pa.—C. E. Stewart & Co., of Lancaster, are building a bridge across the Delaware for the Jersey Central R. R. for a line to connect with the Belvidere Division of the Pennsylvania R. R.

Cumberland, Md.—A railway bridge is to be built over the Susquehanna.

Norfolk, Va.—The County Supervisors have appropriated $8,000 for roads and bridges.

tion of the viaduct over the railway tracks on High St. at the Union Depot.

Montreal Harbor.—The Harbor Commissioners are building extensive wharf accommodation at Hochelega, and a public vote is to be taken on the proposition to issue $1,000,000 for the dike and permanent improvements.

ELECTRICAL.

Electric Light.—*Rouse's Point, N. Y.*—A company has been organized to light Rouse's Point, Champlain, and Moers. Power is to be derived from the Big Chazy river above Champlain.

Fayetteville, N. Y.—The Thomson-Houston Electric Co. has a contract for lighting the town.

Union Hill, N. J.—A contract has been awarded to the Heisler Electric Light Co.; the plant will cost $50,000.

Phœnixville, Pa.—A movement is on foot to introduce electric light by putting in machinery, to be owned by the town, at the water-works.

Alexandria, Va.—The city has accepted the electric light plant from the electric light company.

Martinsburg, W. Va.—The Electric Illuminating Co. has been organized by CHAS. J. FAULKNER, S. W. WALKER and H. C. BERRY. Capital stock, $50,000.

Weston, W. Va.—The Weston Electric Light & Power Co. has been incorporated by J. S. LEWIS, E. RALSTON, and W. G. BENNETT. Capital stock, $100,000.

Jeffersonville, Ind.—The Electric Light & Gas Co. will erect a power station for its dynamos on Maple St.

Detroit, Mich.—An ordinance has been passed authorizing the Edison Illuminating Co. to lay pipes, erect poles and string wires.

West Superior, Wis.—A contract has been made with the Superior Water, Light & Power Co. for 50 additional arc lights for street lighting at 40 cts. per night.

St. Charles, Mo.—The Council has appropriated money for plans and specifications for furnishing an electric light plant, and to ascertain what the lighting would cost by contract.

Superior, Neb.—An electric lighting franchise has been granted to ROBERT GUTHRIE.

Schome, Wash.—The Fairhaven Electric Light, Power & Motor Co. has been organized by PIERCE EVANS, J. F. WARDON, and GEO. A. BLACK. Capital stock, $100,000.

Raton, N. M.—The Raton Electric Light Co. has been incorporated by RUSSELL MARCY, M. A. MCMARTIN, and C. A. FOX. Capital stock, $10,000.

Laredo, Tex.—The Laredo Improvement Co. wants to contract for an electric light plant with a capacity for 50 arc lights of 1,200 c. p., and 1,000 incandescent lights of 20 c. p.

London, Ont.—It is proposed to light the city by the system now in use at St. Mary's. City Engineer TRACY has recommended this system.

St. Paul, Minn.—The following proposals have been received by T. A. PENDERGAST, City Clerk, for the arch bridge on the Mendota road, and by L. W. RUNDLETT, City Engineer, for the superstructure of the Burr St. bridge. For the former there was also an incomplete bid from J. McNaughton, of St. Paul. A. MUNSTER is Assistant Engineer in Charge of the Bridge Department.

ARCH BRIDGE.

Class.	Quantity.	Charles Stone, St. Paul.		Rheaume & St. Pierre, St. Paul.		Jno. W. Doherty, St. Paul.		Wm. Manteuffel, St. Paul.		Paul Haufft & Co., St. Paul.		H. H. Longfield.	
Excavation, cu. yds.	210	0.30	$63.00	0.50	$105.00	0.25	$52.50	0.75	$157.50	0.55	$115.50	2.00	$420.00
Masonry " "	186	6.00	1,116.00	8.00	1,488.00	7.50	1,395.00	5.50	1,023.00	8.25	1,534.50	7.00	1,302.00
Timber, pine, ft. B. M.	127,000	20.00	2,540.00	29.90	3,797.30	27.00	3,429.00	40.00	5,080.00	43.00	5,461.00	30.40	3,860.00
" oak " "	4,500	30.00	135.00	50.00	225.00	35.00	157.50	50.00	225.00	50.00	225.00	100.00	450.00
Paving, sq. yds.	654	1.06	693.24	1.65	1,079.10	2.00	1,308.00	2.00	1,308.00	1.10	719.40	0.95	621.30
Iron, wrought, lbs	17,200	0.035	602.00	0.0325	559.00	0.06	1,032.00	0.04	688.00	0.04	688.00	0.05	860.00
" cast "	8,500	0.025	212.50	0.0275	233.75	0.035	297.50	0.04	340.00	0.03	255.00	0.05	425.00
			$5,361.74		$7,487.15		$7,671.50		$8,821.50		$8,998.40		$7,888.30

BURR ST. BRIDGE.

Class.	Quantity.	Mount Vernon Bridge Co.		Penn Bridge Co.		Lassig Bridge & Iron Co.		H. N. Elmer, (New Jersey Steel & Iron Co.)		Olaf Hoff, (Schiffler Bridge Co.)		H. H. Longfield, (Chicago Bridge & Iron Co.)	
Iron erected, complete, lbs.	120,000	0.073	$5,160.00	0.0467	$5,604.00	0.0408	$4,896.00	0.049	$5,880.00	0.044	$5,280.00	0.046	$5,520.00
Sidewalk, railing, lin. ft.	159	1.90	302.10	2 85	453 15	9.00	1,431.00	3.00	477.00	2.50	397.50	2.50	397.50
Wooden sidewalk, roadway, etc., lin. ft.	70	9.00	630.00	10.50	735.00	2.15	150.50	9.40	658.00	11.50	805.00	12.00	840.00
			$6,092.10		$6,792.15		$6,477.50		$7,015.00		$6,482 50		$6,757 00

Barbourville, Ky.—The city will build a bridge across the Cumberland River at a cost of $15,000.

Leeds, Ala.—P. W. East & Co. have contracts for two bridges across the Little Cahaba River.

Chattanooga, Tenn.—The Chattanooga Land, Coal, Iron & Railway Co. will build a bridge across the Tennessee River, by which the Chattanooga & Western R. R. will enter the city.

Astor, Fla.—A railway bridge is to be built over the St. John River.

Sharonville, O.—The County Commissioners have decided to erect a bridge over the canal.

Bosque County, Tex.—The contract for two iron bridges over the Bosque River at Iredell and Valley Mills has been awarded to the Milwaukee Bridge & Iron Works, at $11,990.

Yankton, Dak.—All bids for the James River bridge have been rejected, and the commissioners will advertise for proposals for a two-span and cheaper bridge, instead of the 380 ft. span proposed. Particulars can be obtained of E. PALMER, County Engineer.

Nevada City, Cal.—An iron bridge is to be built across Deer Creek at a cost of $2,700.

Astoria, Ore.—The Astoria & South Coast Ry. Co. will build a bridge across Young's Bay.

Campbellford, Ont.—The contract for the new Grand Trunk bridge has been awarded to the Central Iron Bridge Works, of Peterboro, Ont. These works are also building the bridge at Yonkers for the Napanee, Tamworth & Quebec Ry.

Coteau Landing, Que.—Dredging for the last pier for the Canada Atlantic Railway bridge over the St. Lawrence here has been finished. The bridge will probably be opened for traffic in January.

Canals.—*Leesburg, Fla.*—The Ocklawaha Canal & Drainage Co. has been incorporated by T. C. BANIER, J. R. CUNNINGHAM, O. P. ROOKS and others to construct a canal from Silver Spring Run, in Marion County, to Lake Panasoffkee, in Sumter County. The capital stock is to be $100,000.

Newark, N. Y.—The State engineers are preparing to remove the middle lock of the canal.

Minneapolis, Minn.—The contract for the steel arch bridge has been let to the Wrought Iron Bridge Co., of Canton, O., at $72,881. The Mount Vernon Bridge Co. bid $67,893 but refused the "no interest" provision, and proposed to add $3,400 to their bid on the ground that the cost of steel and freight rates would probably go up.

Viaduct.—*Columbus, O.*—Mr. MAIZE has introduced a resolution in the Council, which was adopted, for the appointment of a committee of five members of council, with city engineer and solicitor, to report a plan and what legislation, if any, is necessary for the construc-

SEWERAGE AND MUNICIPAL.

Sewerage.—*Orange, N. J.*—The Common Council has decided on active work in the direction of sewerage. CARROLL Ph. BASSETT, C. E., has been engaged to prepare working plans and specifications for carrying the sewage to tide water. Two plans are to be made: One by way of the Second River to the Passaic River, near Belleville, and the other by way of Lyons Farms and the Newark Meadows to Newark Bay. In both schemes a pumping station will be necessary. The cost of the sewerage system is roughly estimated at $450,000.

Fort Snelling, Minn.—The sewerage system is to be extended, and the contract for the work has been awarded to Harrison & Hawley.

Portland, Ore.—The sub-committee of the Sewerage Commission has received several communications from eastern sanitary engineers. Mr. EMIL KUICHLING, E. C., of Rochester, N. Y., has made a proposition to make a general report and specifications for either a separate or combined system, as decided upon by the city, with size of sewers designated upon a properly-contoured map of the city, said map to be furnished by the committee. The area of the city, or that portion which is to be provided with sewers will not exceed 2 or 3 square miles. The sub-committee, after considering the matter, concluded to recommend to the commission that Mr. KUICHLING be employed to devise a "separate system" of sewerage.

Los Angeles, Cal.—A large system of sewerage, with purification works, is to be recommended by the Sewer Commission. They further recommend that the location of the purification works, and the determination of the question whether the raw sewage should be purified at one place or at more than one, as well as the question of the quantity of the land to be obtained and the location thereof for the erection of said works and treatment of the sewage be left to the judgment of expert sanitary engineers to be selected for that purpose by the City Council. The total estimate is as follows:

Storm drains	$ 75,000
Main and intercepting sewers	300,000
Grounds for treating sewage and erection of works and conduits to and from sewer	100,000
	$475,000

Street Work.—*Waterbury, Conn.*—The city has voted down the proposition to issue $100,000 for paving.

Knoxville, Tenn.—Work is progressing on the streets of North Knoxville. Curbing, guttering and new sidewalks are being put down as fast as possible, and the macadam keeps pace with the other work.

Omaha, Neb.—A considerable amount of paving is being done with Colorado sandstone on sand foundation.

Gas Lighting.—*Charleston, S. C.*—The council has contracted with the gas company for 810 lamps, 5 ft. burners as now, along the mains of said company, to follow the moon, at $16.7229 each per annum, or $13,464; and for lighting the public buildings and institutions at $1.75 per 1,000 ft.

WATER-WORKS.

NEW ENGLAND.

Springfield, Mass.—The Water Commissioners, in their report on methods of improving Ludlow water, recommend that some of the proposed changes be made at once. Their plan is to tap the streams which feed Ludlow Reservoir before they reach the basin or adjoining swamps, and convey the water through canals into a small reservoir near the head of the present main. Also to build a canal about one mile long to take the water of Broad Brook above the swamp, and lead it into the canal which now conveys the water from Axe-factory Brook to the reservoir. Instead of allowing the combined streams to empty into the old reservoir, a canal will be built along the south side of the pond to the small reservoir to be constructed just above the main. The water of Higher Brook is to be brought around the west side of the Ludlow Reservoir into the new one in a similar way. Then the old basin is to be drawn off, cleaned, refilled and held in reserve. The estimated cost is $40,000.

Boston, Mass.—An order has been passed authorizing a water loan of $1,045,000. The City Council has authorized the expenditure of $150,000 for new pipe.

East Hartford, Conn.—At a special meeting of the stockholders of the East Hartford Water Co. votes were passed accepting the amendments to the charter granted by the Legislature of 1889. The first allows the company to increase its capital stock to $100,000, and to issue bonds not exceeding 75 per cent. of the capital, the rate of interest not to exceed 6 per cent. Section 3 incorporates the company's limit of territory, to be known as the East Hartford Fire District. Wheeler & Parks, of Boston,

will probably take the balance of the stock and proceed at once to lay pipes. It is proposed to locate 50 hydrants within the limits of the fire district at an annual rental of $30 each. President, E. J. McKNIGHT; Secretary, A.C. LIEBURT.

Litchfield, Conn. — T. H. McKENZIE, Engineer of the company sends us the following information:

The contract for constructing a dam and appurtenances has been awarded to J. S. Smith, of New York. Contract price about $17,000. Furnishing pipes, hydrants and valves, R. D. Wood & Co., of Philadelphia, at $19,500. Laying distribution mains, Moore & Shaler, of Newburg, N. Y., about $6,200. The contract for laying the larger mains and constructing the distributing reservoir have not yet been awarded.

MIDDLE.

Jordan, N. Y.—Pipe laying for the distribution system is progressing rapidly.

Jamaica, N. Y.—The Woodhaven Water Supply Co. has applied to the board for permission to make a contract with the town for certain territory near Woodhaven. It was found that the Jamaica Township Water Supply Co. was already on the territory asked for, and the matter was adjourned to Nov. 25.

Amsterdam, N. Y.—The Water Commissioners have purchased Little Round Lake from GEO. WEST for $2,650. It is 20 miles from the city and is to be used as a source for an additional water supply. The estimated cost, including the survey, laying of pipe, land damages, the lake and the work of constructing the storage reservoir, is $118,000. Contracts will be let and work begun as soon as possible.

Brooklyn, N. Y.—Bids have been received from the parties named for the following described work, including the sections of the new aqueduct to extend from Rockville Center to Massapequa Pond:

Section 1.—Comprising the furnishing, delivering and laying of the 48-in. delivery pipe from the proposed storage reservoir to the new pumping station at East New York, also the 36-in. delivery pipe from the above mentioned reservoir to the present conduit, together with building the requisite culverts and making alterations in the existing structures; Edward Freel, $1,042,685.50; Cranford & Valentine, $1,013,772. Both of Brooklyn.

Section 2.—Comprising the storage reservoir between the stations of Rockville Center and Baldwins, and a portion of the adjoining pipe lines: John McNamee, of Brooklyn, $840,009; Smith, Brown & Coleman, of New York, $793,927; Edward Freel, $762,678; and Cranford & Valentine, $8856,308.

Section 3.—Comprising the furnishing, delivering and laying of the 48-in. cast-iron pipe, branches and special castings for the force main line from the Milburn pumping station to the new storage reservoir, and building the requisite culverts: John McNamee, $75,639; Charles Hart, $83,219.10; John H. O'Rourke, $63,120.

Section 4.—Comprising the engine and boiler houses and chimney for the pumping station at Milburn: Daniel J. Crean, $171,000; John McNamee, $162,000; John H. O'Rourke, $154,845.

Section 6.—Comprising the supply ponds of Milburn and East Meadow, the pump well and pocket, and the conduit from the latter to the east end of the East Meadow dam, with the necessary waste weirs, gate houses, culverts, manholes, pipe lines and other appurtenances: John McNamee, $463,608; Smith, Brown & Coleman, $460,764; Charles Hart, $472,844.20; John H. O'Rourke, $397,167.50.

Section 7.—Comprising the Newbridge supply pond, and the conduit from the east end of the East Meadow dam to the west end of the Ridgewood dam, with the necessary waste weirs, gatehouses, culverts, manholes, pipe lines and other appurtenances: James F. Gillen, $306,145; Charles Hart, $392,724.20; Smith, Brown &Coleman, $397,956; Cranford & Valentine, $409,749.50; John H. O'Rourke, $345,560.

Section 8.—Comprising the supply ponds of Ridgewood and Massapequa, and the conduit from the west end of the Ridgewood dam to the Massapequa gate chamber, with the necessary waste weirs, gate houses, culverts, manholes, pipe lines and other appurtenances: James F. Gillen, $273,955; Smith, Brown & Coleman, $362,127; Charles Hart, $464,480.50; Cranford & Valentine, $432,183; John H. O'Rourke, $309,482.

Plans for Section 5 have not been completed.

Syracuse, N. Y.—The final hearing on the question of the city taking its water supply from Skaneateles Lake was given at Albany on Nov. 13 and 14. A decision will probably be given by Attorney-General TABOR within 60 days.

Suspension Bridge, N. Y.—The Board of Water Commissioners are about to borrow $6,000, to be secured by 4 per cent. bonds; $3,000 payable in 17 years and $3,000 in 18 years.

Bordentown, N. J.—From a recent analysis the water being supplied from the Delaware River was found to be unfit for use.

Vineland, Pa.—The new works have been completed, and an official test will soon be made.

Peckville, Pa.—The town is to be supplied with water as soon as pending difficulties between the Olyphant and Archbald water companies, as to which has the right to lay mains through the streets, is decided.

SOUTHERN.

La Grange, Ga.—The La Grange Water-Works & Electric Light Co. has been incorporated.

Ocala, Fla.—Edward F. Joyce, of St. Augustine, has contracted with the Jeter & Boardman Gas & Water Association, of Macon, Ga., to sink a 12-in. artesian well for the new works.

Oxford, Ala.—Contracts for building the works will be let soon. Address R. P. THOMPSON, Mayor.

Oxford, Miss.—JOHN H. KIMMONS, Mayor, may be addressed for information regarding the new works.

Lake Charles, La.—Permission to lay mains through the town has been granted to the Calcasieu Artesian Well & Oil Co.

Murfreesboro, Tenn.—It is reported that a franchise for furnishing a water supply has been granted to J. C. Thompson, of Manchester, and that he is in the market for cast-iron pipe and a stand-pipe.

Covington, Ky.—A resolution has been passed directing the City Solicitor to prepare an ordinance authorizing the city to sell bonds not to exceed $225,000, and take up the bonds maturing April 1, 1890.

Denver, Col.—The Board of Supervisors has granted a franchise to the Citizens' Water Co. to lay mains in the city. By the terms of the functions the city may at any time purchase the company's plant, at a price to be fixed by three apprisers; one to be chosen by the city, one by the company, and the third by the two thus appointed. Also that 40 miles of mains shall be laid within 3 years, and that the company shall not, under forfeiture of its franchise, sell the plant or combine with any other company doing business in the city. RICHARD HOLME, Secretary and Manager, is reported as stating that the company will take immediate steps to carry on the work on a large scale, and that an order for about $300,000 of pipe will be placed at once. Also that about $100,000 will be expended for land and water rights.—A 30,000,000-gall. reservoir will be constructed on Cottage Hill, North Denver, and a 40,000,000-gall. low service reservoir will be constructed at the head of Alameda Ave.

NORTH CENTRAL.

Columbus, O.—Two plans have been presented by the Fire & Water Committee for providing better fire protection. One is to extend the present Holly system at an estimated cost of $250,000. The other is to provide steam engines for the fire department. A resolution has been passed by the Committee of the Board of Trade urging that steps be taken for making a full investigation of the matter, and that the Board of Trade co-operate with the City Council and Trustees in obtaining such legislation as may be necessary to carry out the plans finally adopted.

Lockland, O.—The Village Council is considering the advisability of accepting the proposition of the Queen City Water Co. to lay 5 miles of mains, and set 45 fire hydrants, at $1,800 per year. The matter will be taken up for consideration on Nov. 26.

Marietta, O.—JOHN W. HILL, of Cincinnati, Consulting Engineer for the new works, informs us that contracts have been let as follows: Pipe and specials, Lake Shore Foundry, of Cleveland; Pumping machinery, Gordon Steam Pump Co., of Hamilton; Valves, Rensselaer Mfg. Co., of Troy, N. Y.; Hydrants, Bourbon Copper & Brass Works, of Cincinnati; Valve boxes, Bingham & Taylor, of Buffalo, N. Y.; Reservoir tanks, Riter & Conley, of Pittsburg, Pa.; Pipe laying, pumping station and pump well, R. Meredith; Tank foundation, Jas. J. Ramsey.

Hudson, Mich.—A majority vote of 324, in favor of issuing $30,000 of bonds for constructing works, was recently taken.

Portland, Mich.—The stand-pipe is to be furnished by the Porter Mfg. Co., of Syracuse, N. Y.

Iron Mountain, Mich.—A good system of works is wanted. The city will grant a franchise. Correspondence is solicited by J. H. SANDUCOCK.

Pinckneyville, Mich.—The contract for constructing works has been awarded, and work begun. J. L. MURPHY is Mayor.

Chicago, Ill.—By an act passed by the last Legislature, the city is authorized to expend $60,000,000 in providing the city with pure water, and the "Drainage District" with a system of sewage. Nine commissioners who will have charge of the work will be elected on Dec. 12. The act provides that the work must be completed in seven years, which allows an annual expenditure of about $8,000,000 for that period.

South Superior, Wis.—Bids are wanted for sinking drive wells, by the South Superior Land Improvement Co.

NORTHWESTERN.

Keokuk, Ia.—It is reported that the City Council has declared the company's franchise forfeited.

Litchfield, Minn.—The City Council has ordered a special election for Nov. 25, to vote on the question of issuing $225,000 of bonds for building works and providing electric lights.

Anoka, Minn.—The Porter Mfg. Co., of Syracuse, N. Y., will furnish the stand-pipe.

New Ulm, Minn.—The artesian well which is to furnish the supply for the new works has reached a depth of 220 ft.

St. Paul, Minn.—The Water Board is considering the advisability of laying a main, and establishing a pumping station in the Sixth ward, to provide water for West St. Paul.

South St. Paul, Minn.—Works are projected.

Lawrence, Kan.—Judge BENSON has granted A. HADLEY, receiver of the water company, an order for $15,000 worth of improvements upon the system. Work will be commenced at once. Three reservoirs will be built and pipes laid to Haskell Institute. Settling basins will probably be constructed.

Wymore, Neb.—The town has voted to issue $30,000 of water bonds.

Canton, Dak.—Citizens are discussing the question of sinking artesian wells for fire protection. Address C. B. KENNEDY.

Fort Scully, Dak.—Plans and specifications for works are being prepared by J. W. TROY, Chief Engineer and Superintendent of the Pierre, Dak., works. Work will be commenced in the spring as early as possible.

SOUTHWESTERN.

Tyler, Tex.—The Water-Works Company is now laying 5 miles of additional mains. The city has also contracted for 75 additional fire hydrants.

New Castle, Col.—Sealed bids will be received until Dec. 9, for $15,000 of 8 per cent. water bonds, interest payable semi-annually. Address A. BONDURANT, Jr., Town Recorder.

PACIFIC.

Tacoma, Wash.—The Washington Water Supply and Power Co. has been incorporated at Olympia. Capital stock, $3,000,000. The Trustees are: E. F. RUSSELL, Oakland, Cal.; W. S. MCFARLAND, Portland, Ore.; R. H. CATHNEY, JACKSON HUNT, and E. F. RUSSELL, of Tacoma.

Colville, Wash.—We have received the following information from FRANK C. HAMMOND, Town Clerk:

A gravity system of works is to be constructed by the city. The estimated cost is $60,000. The supply will be taken from Mill Creek, 2½ miles distant. No contracts have yet been made. Work will probably be begun about April 1, 1890. R. B. THOMAS, is the Engineer. BENJAMIN P. MOORE can be addressed for information. Population, 500.

Salt Lake City, Utah.—Petitions have been received for a considerable amount of additional mains, and permission granted by the City Council for laying them.

San Francisco, Cal.—It is reported that the El Dorado Water and Deep Gravel Mining Co. will submit a scheme for supplying the city with water. The company owns several lakes and reservoirs in the Sierras, and proposes to deliver by pipe lines 100,000,000 galls. of water daily.

Calgary, No. W. Ter.—The Calgary Water Power Co. has been incorporated to build works, etc. The capital stock is $100,000. Members of the company are: P. A. and J. E. PRINCE, F. H. and D. R. MOON, and J. K. KERR.

CANADA.

London, Ont.—A report on the question of increasing the capacity of the present water supply has been presented to the City Council by City Engineer TRACY. He recommends taking the additional supply from springs, and estimates the cost of the new work at $8,000.

Fort William, Manitoba.—The Canadian Pacific Ry. Co. is extending the supply mains.

Winnepeg, Manitoba.—City Engineer RUTTAN'S plans for improving the water power have been approved by the Government at Ottawa.

ARTESIAN WELLS.

Melbourne, Fla.—A well is being sunk by Nesbett & Turner, for Mr. HECTOR.

Catnon, Dak.—A good flow of water has been secured by C. B. KENNEDY, from a well at a depth of 80 ft.

IRRIGATION.

Escondido, Cal.—A vote of 137 to 12 has been cast in favor of establishing an irrigation district under the Wright Act. The supply will be taken from the Pomona Water Co's. flume. The Directors are; E. D. C. COTHERAN, M. CULP, T. B. THOMAS, C. L. ESPEY, E. DEVAL. Col. GRAHAM, Treasurer; G. W. BEBKELEY, Assessor; A. H. HILL, Collector.

Elsinore, Cal.—The citizens are discussing the question of forming an irrigation district.

Orland, Cal.—The Orland Southside Irrigation District is offering its bonds for sale at par.

Corning and Kirkwood, Cal.—The Thoms Creek and the Corning Irrigation Districts are to be established.

New Mexico.—The El Capitan Cattle Co. of Lincoln County has let a contract for building a 6-mile flume to convey water from the Capitan Mountain.

Huron, So. Dak.—The South Dakota Irrigation Co. has been incorporated. The original intention was to issue $100,000 of bonds, but it is probable that the amount will be increased to $500,000.

Castle Rock, Col.—A contract has been let for constructing the Lake Gulch Reservoir and work has been commenced. The contract price is about $200,000.

Grand Junction, Col.—Surveys for a headgate, 23 miles from the city, have been begun by W. C. Lathrop & Co., of Denver. The canal will be 100 miles long and reclaim 200,000 acres of land. A solid masonry dam, 15 ft. high will be built across Grand River at the headgate.

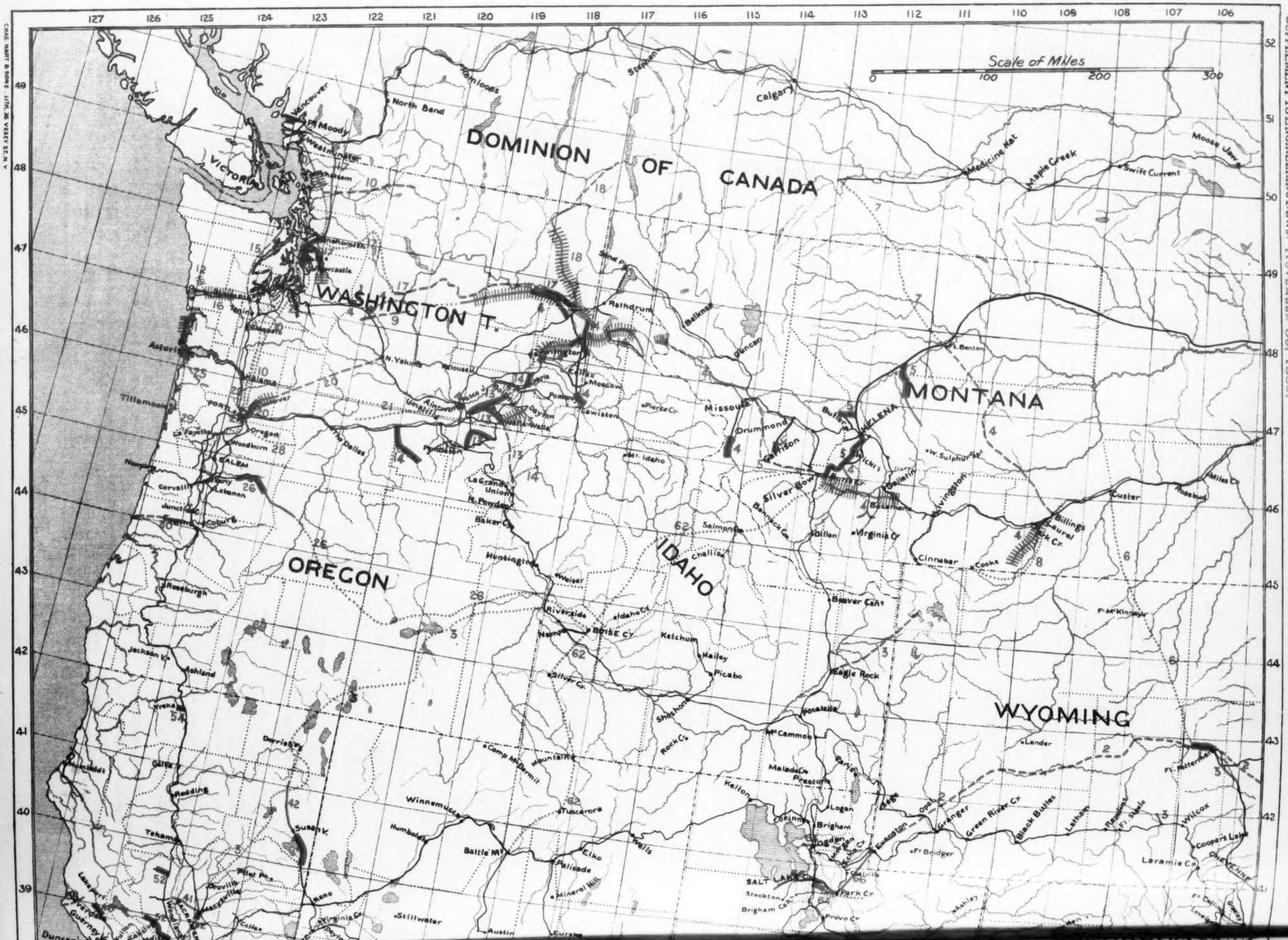
ANNUAL REPORTS.

The following water-works reports have been received.

Illinois.—Rock Island: Supt., JNO. A. MURRIN.

Wisconsin.—Madison: Supt., E. M. NICHOLS.

Missouri.—St. Louis: Water Commissioner, M. L. HOLMAN.


Scale of Miles
0
100
200
300
DOMINION OF CANADA
WASHINGTON T.
OREGON
IDAHO
MONTANA
WYOMING
UTAH
NEVADA
COLORADO
Vancouver
Victoria
Port Moody
Westminster
North Bend
Kamloops
Sicamous
Calgary
Medicine Hat
Maple Creek
Swift Current
Moose Jaw
Seattle
Tacoma
Olympia
Portland
Astoria
Salem
Oregon City
Albany
Corvallis
Eugene City
Roseburg
Coos Bay
Jacksonville
Ashland
Yreka
Redding
Weed
Susanville
Oroville
Marysville
Red Bluff
Tehama
Colfax
Truckee
Reno
Carson City
Virginia City
Gold Hill
Silver City
Dayton
Walla Walla
Lewiston
Moscow
Pierce City
Orofino
Mt. Idaho
The Dalles
Pendleton
La Grande
Union
Baker City
N. Powder
Huntington
Weiser
Boise City
Idaho City
Silver City
Ketchum
Hailey
Picabo
Challis
Salmon
Rathdrum
Bellevue
Belknap
Duncan
Missoula
Drummond
Garrison
Butte
Helena
Ft. Benton
W. Sulphur Sp.
Bozeman
Silver Bow
Bannack City
Dillon
Virginia City
Cinnabar
Cooke
Billings
Laurel
Park City
Livingston
Custer
Miles City
Rosebud
Ft. McKinney
Beaver Canon
Eagle Rock
Pocatello
Shoshone
Rock Cr.
McCammon
Malade Cr.
Preston
Paris
Logan
Brigham
Ogden
Kelton
Corinne
Evanston
Opal
Granger
Green River Cr.
Black Buttes
Latham
Rawlins
Ft. Steele
Wilcox
Coopers Lake
Cheyenne
Laramie Cr.
Ft. Bridger
Lander
Ft. Fetterman
Ft. Collins
Greeley
Stockton
Brigham City
Park City
Provo City
Salt Lake City
Ashley
Stillwater
Austin
Eureka
Elko
Palisade
Mineral Hill
Battle Mt.
Humboldt
Winnemucca
Susan V.
Tuscarora
Camp McDermit
Mountain City
Rock Cr.
Shoshone
Wells
Ward
Duncan's Mill
Guerneville
Healdsburg
Cloverdale
Lakeport
Calistoga
Napa
Vallejo
Petaluma
Sonoma
Santa Rosa
Glen Ellen
Sebastopol
Fulton
Windsor
Mark West Springs
Healdsburg
Cloverdale
Ukiah
Willits
Laytonville
Round Valley
Covelo
Hopland
Lakeport
Calistoga
Napa
Vallejo
Petaluma
Sonoma
Santa Rosa
Glen Ellen
Sebastopol
Fulton
Windsor
Mark West Springs

ENGINEERING NEWS SERIES OF MAPS: No. 20.

FAR WESTERN STATES.

TRACK LAID DURING 1888,

TRACK LAID SINCE JAN. 1, 1889,

LINES UNDER CONTRACT OR CONSTRUCTION,

LINES SURVEYED OR UNDER SURVEY,

PROJECTS OF SOME PROMISE,

Figures refer to the accompanying list.
Lines having the same number are controlled in the same interest.

(Last preceding issue of this Map was on March 31, 1888.)

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